WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

CANCER can be arrested by an injection of one of the coal-tar derivatives—methyl violet. What say the medical profession?

* *

The Jewish colonies planted in Argentina by Baron Hirsch are in a deplorable condition. Money is not necessarily amelioration.

* *

The efficiency of the electric motors—of 100 horse-power—on the City and South London Railway averages 92 per cent.

* *

The Singer, Elswick, and Hadley cycles are in repute among Russian cyclists, as the result of the Moscow Cycle Exhibition. *Not* "made in Germany"!

* *

Recent experiments suggest that asbestos paper is not only of no advantage in a floor as a protection against fire, but it probably aids the conflagration. How?

* *

A Frenchman has succeeded in making pearls by boring holes in pearl oysters, dropping in minute glass beads, and then hermetically sealing the holes. No samples have reached us.

* *

A canvass of the operatives throughout the Rochdale cotton district on the eight-hours question, shows a great majority in favour of a compulsory eight-hours day.

* *

The Coventry Machinists Company have decided to commence manufacturing their machines in America to avoid the heavy import duty. The McKinley tariff again!

* *

Fire-proof paper at last! A mineral resembling asbestos in its properties has been discovered in immense deposits in Columbia. It is the colour of amber, perfectly transparent, and incombustible.

* *

The box shape of harmoniums is fast giving way to more artistic and decorative cases made up in the form of davenports, bookcases, and sideboards with bevelled glass panels and shelves for bric-à-brac, etc. Well this is so, for there is ample room.

* *

A new pneumatic tire for carriages of all descriptions is made in such a manner that it is impossible to puncture or burst it. An unpuncturable and unburstable pneumatic tire for cycles would make every cyclist's heart rejoice.

* *

Three hundred and ninety-three wood-laden vessels, with a tonnage of 291,844, have entered Surrey Commercial Docks; this, as against 300 vessels, of 216,342 tonnage, last year, and 96 firewood ships, as compared with 70 for the same period.

* *

A paper church! One has been built at Bergen. The pulp was compressed by powerful machinery, and rendered waterproof with a solution, one of the principal constituents of which is lime. Fiery discourses might be dangerous here.

* *

The largest ærolite ever known to have fallen is lying in the Caspian Sea. It made a terrific noise as it rushed through the air, and the white-hot mass illuminated the surrounding sea and country. On its striking the water immense clouds of steam rose, and volumes of water were thrown up.

* *

Soap- and candle-making machinery and brick and cement machines are wanted in Alexandria. In Paraguay, cotton-gins and presses; stills for distilling sugar cane and orange leaves; also decorticating machines, and agricultural machinery generally is required. Makers—why not look this market up?

* *

Peat compares unfavourably with coal as a fuel. In its ordinary condition it is five times more bulky, while it contains from 15 per cent. to 25 per cent. of water, and seldom less than 10 per cent of ash. Two and a half tons of ordinary peat only do the same work as one ton of average Staffordshire coal.

* *

An electric banquet, with a menu wholly cooked by electricity, has been given at Ottawa. This is the first instance in the history of the world of an entire meal being cooked by electricity. Soup, fish, boiled, roast, *entrées*, vegetables, pudding, pastry, fruits, were all there. Bravo, Messrs. Ahearn and Soper, who have solved the electric cooking problem!

* *

Sailors' wages in Southern-going steamers were £2 10s.; and firemen, £2 15s. per month, four years ago; and Western-going traders paid sailors, £3 10s.; and firemen, £4. The Union was formed, and wages rose to what they now are for Southern vessels, £4 to sailors, and £4 10s. to firemen; on Western vessels, sailors, £4 10s.; and firemen, £5.

* *

While many improvements have been effected in the interior of pianos, the exterior case remains with us as of old. True, the silk and fret have given place to panels incised, and marqueterie and screw in legs have made way for bracket trusses, but beyond this variation there is a striking similarity of design amongst all makers. There is ample scope in the piano case for inventive genius and design. What is needed is something that will harmonise better with its surroundings and capabilities.

* *

An automatic letter distributor is at work in Geneva. In the lofty buildings a common letter-box is fitted with compartments corresponding with each storey. When the postman puts the letters into this, an electric circuit is closed, and an electro-magnet opens a valve whence water flows into a cylinder connected by a chain with the letter-box. As this ascends it discharges its letters at the proper flats, and on reaching the highest floor the water is discharged and the letter-box returns to the ground floor.

* *

The largest vessel in the world—the *Campania*—is expected to cross the Atlantic in five days and a quarter. Her length is 600 ft., being only 92 ft. shorter than the ill-fated *Great Eastern*. Her machinery consists of twin screws of phosphor-bronze, driven by two pairs of triple-expansion engines, each of 15,000 indicated horse-power. With the exception of the rudder, which had to be made at Krupp's works, the whole of the vessel is of British construction. Why not the rudder?

COMBINATION INKSTAND AND PEN-RACK

BY THE OFFICE BOY.

THE want of a compact inkstand and pen and paper rack for office use, to replace an old-fashioned affair of some years' standing (a "treasure of the guv'nor's"), without expending, from a not overflowing exchequer, the required 20s. or 30s. necessary to purchase such an article, as well as for the pleasure experienced in executing little jobs like this (and at which he is better suited than in describing "how to do it"), set the writer considering what could be done in the amateur's workshop. Result, the successful production of a handy little piece of office-table furniture, if we may so call it, which cost at the utmost limit 3s., requiring no other than ordinary joiners' tools in the making thereof; although if the reader is the happy possessor of a lathe—to which a small circular saw arrangement is added—a deal of labour is saved in cutting the necessary rabbets, grooving, etc.

The material is $\frac{1}{4}$ in. mahogany, of which from a local boat-builder the writer obtained a quantity of odd pieces—as much as he could conveniently carry away—for the sum of 1s. 3d., and which was of just the right thickness for the job. Take care to pick up the pieces in which the grain runs straight; this will probably save a lot of unparliamentary language in subsequent manipulation. Three glass (or porcelain) inkpots are required, which can be bought at most stationers (cost, glass ones—four for 6d.; a spare one is handy in case of accidents); also two small drawer knobs (glass ones look well, cost—3d. each), and three small brass knobs for the slides to inkpots (cost—1d. each at any shop where fret material is kept).

Now to commence. First cut two side pieces of the shape and size shown (A, A, A, A, Fig. 2*b*), and which must be of rather thicker stuff than the other parts, viz., $\frac{5}{16}$ in. when planed up (remember this when visiting the boat-builder's yard). Carefully square these pieces up, just slightly rounding off the edge at A×, finishing off with sand-paper.

Cut a groove in each piece, as shown at E, $\frac{1}{4}$ in. wide by $\frac{1}{8}$ in. deep, and also one in each piece as shown at F for partition (this is where the circular saw with adjustable table comes in very handy, but of course it can be done with an ordinary rabbet-plane).

Next prepare two rabbet pieces, 5 in. long, of the section shown at Fig. 1, H, and two pieces like J, Fig. 1. These can be either cut with rabbet-plane or the circular saw; in the latter case the top piece, *n j*, must be glued and nailed on with pin brads. Fix the piece J on sides as shown at Fig. 2*b*, and nail on a short ledger piece below at K, same width as the rabbet.

Prepare a piece for the bottom 6 in. wide by 9 in. long (L), rounding off the edges with the plane and finishing off with glass-paper; also a piece (M) for back, $8\frac{1}{2}$ in. long by 3 in. wide, and a wider piece (N) for same, $8\frac{1}{2}$ in. long by $5\frac{1}{2}$ in. wide ($\frac{1}{4}$ in. thick when planed). Carefully plane up, and with a fret-saw cut the ornamental part "to taste"—as the cookery books say—in fact, here is an opportunity for a little display of fretwork.

Cut out a piece in right-hand side-piece for the side drawer, $2\frac{1}{4}$ in. long by $1\frac{3}{8}$ in. wide, as shown in dotted lines in Fig. 2*b*

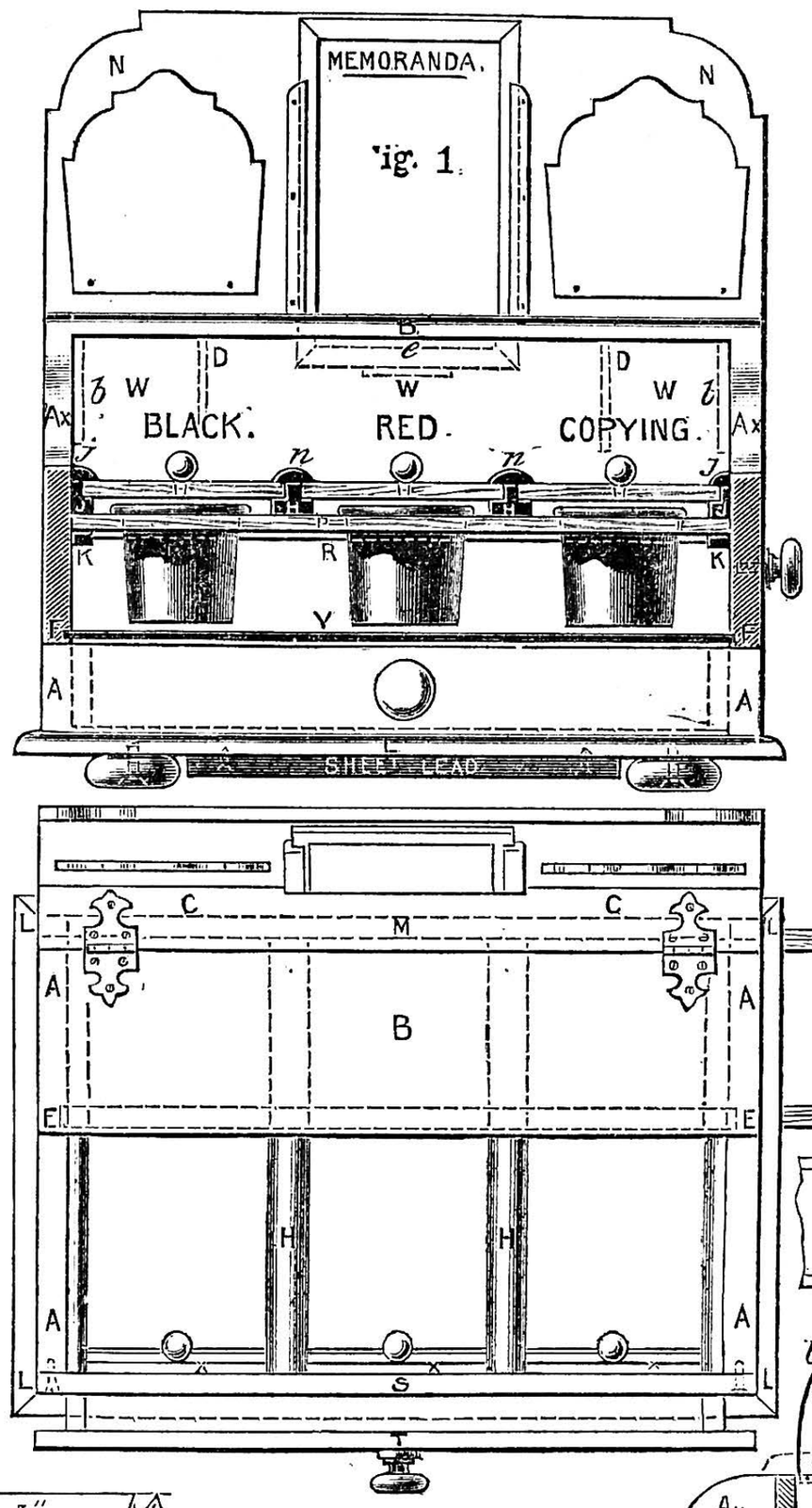


Fig. 1.

Fig. 3.

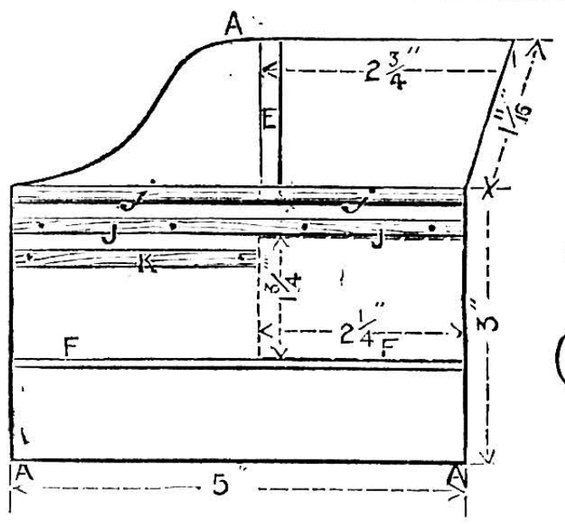


Fig. 2b.

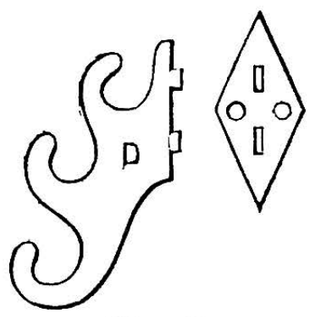
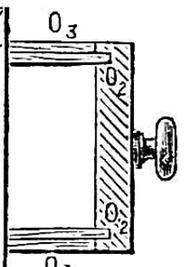


Fig. 2a



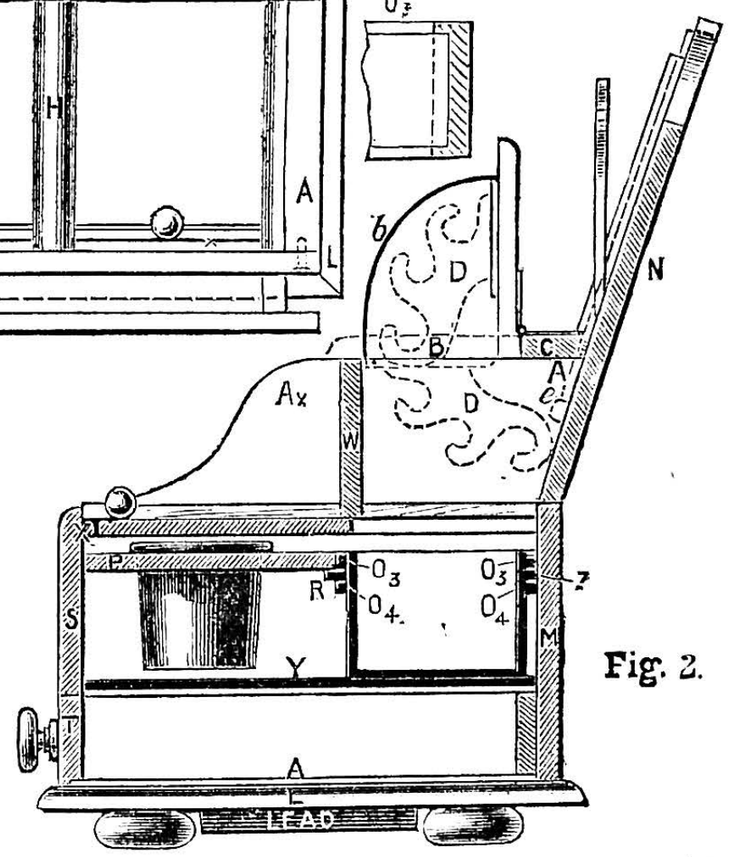


Fig. 2.

Combination Inkstand and Pen-Rack. Fig. 1.—Front View, with Front Piece (S) removed. Fig. 2.—Side View, with Side Piece (A) removed. Fig. 2 a.—Brass Pen-Rack Fittings. Fig. 2 b.—Side showing Rabbet, Ledger Pieces, etc. Fig. 3.—Plan.

front (S), cut it down $\frac{7}{8}$ in. from bottom edge to form front of bottom drawer (T), and screw on the top piece to sides with four brass screws. The two middle rabbet pieces (H *n*) can now be fitted across and glued or nailed to the piece P, which carries the pots, care being taken to get them quite parallel. Unscrew the front (S) again and fit in the three covers, size of which is $2\frac{3}{8}$ in. by $2\frac{3}{4}$ in. by $\frac{3}{16}$ in., which should be made to work easily in the grooves.

Next fit in a piece for the front (W), into the grooves previously cut in sides A, cutting notches in the rabbet pieces, so that this front comes down on to the covers, of course, just leaving space for the covers to work freely. Three strips should be fixed in front as at ×, so that the covers do not come up to the front by this much. A slight "bead" should be cut in front end of cover to make a finish. Finish off and sand-paper the covers, and screw on the front again—just rounding off the top of same—previously to which, however, the partition (Y) must be fitted in the grooves made in side-pieces. This can either be made by planing down a $\frac{1}{4}$ in. board, or a piece of common fretwood $\frac{1}{8}$ in. thick can be used. The front drawer should now be fitted together, for the bottom of which use a piece of the aforesaid fretwood. Nail on the pieces × to the front with four fine brads, brad-punch them in, and fill up with putty.

Next we can proceed to make the side drawer, for which no description is necessary, except that it should be made of the aforesaid $\frac{1}{8}$ in. fretwood, so as to economise space.

It will be seen that the bottom and sides are let into the end piece as at o_2 (Fig. 3); also that two narrow strips are fixed on each side to form runners o_3, o_4; the bottom pieces o_4 need not be more than 2 in. or 3 in. long, and fixed at the *back* end of drawer to form guides to prevent wobbling about. Prepare a piece of stuff for the lid B, $8\frac{1}{2}$ in. by 2 in., and a piece (C) which is fixed across and on the top of side-pieces, and to which the lid is attached with a couple of fancy hinges.

This lid is made to form a pen-rack by the aid of the two little brass fittings (D, D), which are cut out of stout sheet brass with fret-saw (shown in detail at Fig. 2*a*). The supports are soldered or sweated on and fixed to lid with two fine brass screws. Two pieces of stuff $\frac{1}{8}$ in. thick are cut to shape (*b b*) and fixed on lid flush with sides A, to form guides and also to keep the pens in their places. Some sort of a stop must be fixed on bottom of these to prevent the lid being opened further than just upright.

The two letter-racks can be cut out to taste—in fact, here is another opportunity for a little fancy fretwork which would look very effective.

The memorandum tablet is a piece of opal plate (if the reader is an amateur photographer he will no doubt have a "waster" to cut up for this) cut to size ($2\frac{5}{8}$ in. by 4 in.), the edges bound with a piece of bookbinders' cloth and finished off with a tag of same material at the top. This tablet can be let into top as shown at *e*, so as to get as much writing surface as possible, and with a soft blacklead pencil can be written upon both sides.

Four wood knobs are turned up for the feet, of sufficient thickness to allow a good stout piece of sheet-lead being screwed on bottom of stand. This will prevent our "imposing edifice" from being accidentally overthrown during the matutinal process of being dusted by a too energetic "domestic." This will bring us to about the finish of our job, and a vigorous scrubbing with sandpaper, followed by the application of two or three coats of good varnish, should "complete the contract."

If any further information is required, the writer will be pleased to furnish it to any who may ask for it through "Shop."

HOW TO MAKE A HAND-POWER CIRCULAR-SAW BENCH.

BY "CHOPSTICK."

INTRODUCTION—SIZE OF BENCH—DESCRIPTION OF DRAWINGS—EXPLANATION OF MECHANISM BY WHICH THE MAXIMUM OF SPEED AND POWER IS OBTAINED BY THE EXPENDITURE OF THE MINIMUM OF STRENGTH—WHERE TO OBTAIN THE IRON WHEELS REQUIRED—THE DRIVING WHEEL—ALTERNATIVE METHOD OF DRIVING WITHOUT COG-WHEELS—THE TABLE OR TOP—THE FENCE—CONCLUSION.

THIS short paper is written in reply to a correspondent who requested me to give a description of a saw-bench which could be worked by hand in the "Shop" columns; but as I felt that I could neither do myself credit, nor give my correspondent satisfaction, in the necessarily short description which I should be able to crowd into the already overflowing columns of "Shop," I promised to write an article on the subject at my first opportunity; and accordingly I am now about to fulfil that promise, and I trust that not only the reader who asked for the information, but a good number of others, will be benefited by the same.

As it is very unlikely that anyone would be likely to attempt to make such a machine who was not able to understand the framing, etc., of the bench without instructions, I shall not waste time and space in minutely describing the method of setting out and cutting every mortise and tenon; but shall content myself with giving general directions only, leaving it to each individual reader to use his own ability in construction, as it really matters very little in what way the frame is made, so as it is firm and strong, and likely to keep so, which will be secured by using good, well-seasoned timber, and fitting it well together. The size of the bench must be regulated according to the kind of work which it is required for; a useful size for a joiner's shop would be about 6 ft. long by 2 ft. 6 in. wide, and I consider the height should be about 3 ft. The drawings are not drawn to scale, but they are supposed to be for a bench 8 ft. long and 2 ft. 6 in. wide, but the makers will be able to get their measurements from them easily enough. And now for the frame first. Fig. 1 shows plan of top of frame. Fig. 2 the elevation of left-hand side when standing at end A. Fig. 3, elevation of right-hand side. Fig. 4, elevation of end A (Figs. 1, 2, and 3), and Fig. 5 shows plan of top after table is on and bench complete. I think the drawings are sufficiently self-explanatory as far as the framework is concerned, but as to the wheels and driving apparatus, perhaps it will not be so. As will be seen at once, this is quite different from any saw-bench in the market, and I will give my reasons for making it so. It is usual in hand-saw benches for the handle for turning the saw to be on the fly-wheel,

Fig. 6.

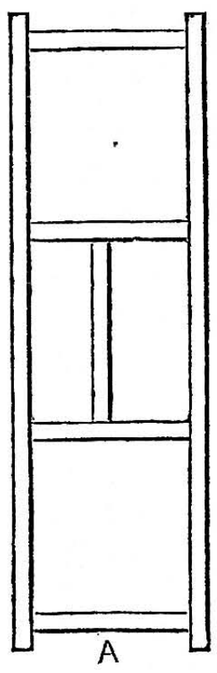


Fig 1.

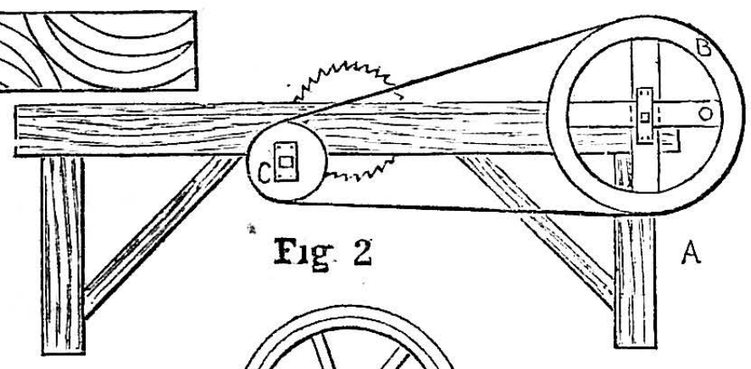


Fig. 2

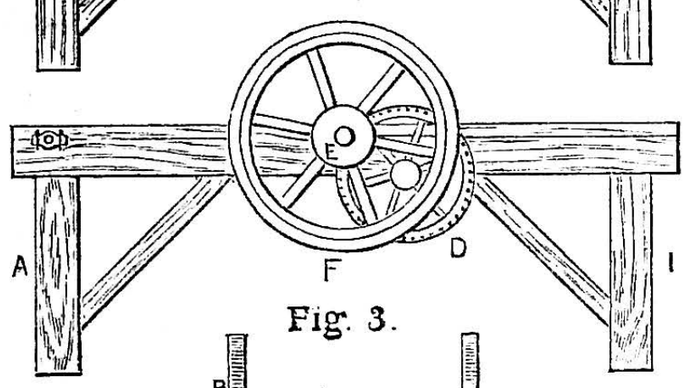


Fig. 3.

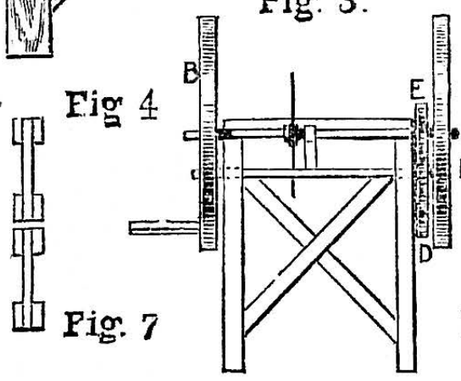


Fig 4

Fig. 7

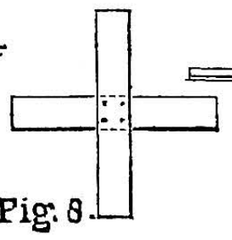


Fig. 8.

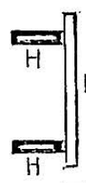


Fig. 9.

Fig. 10.

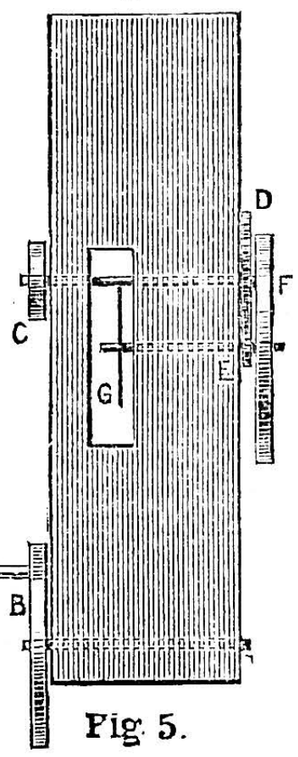


Fig. 5.

Hand-Power Circular-Saw Bench. Fig. 1.—Plan of Top of Frame. Fig. 2.—Elevation of Left-hand Side. Fig. 3.—Elevation of Right-hand Side. Fig. 4.—Elevation of End. Fig. 5.—Plan of Top, showing Position of Wheels, Spindles, and Saw. Fig. 6.—Method of cutting Circles out of Straight Board. Fig. 7.—Section of Driving Wheel. Fig. 8.—Elevation of Centre Part of ditto. Fig. 9.—Plan of Fence. Fig. 10.—End Elevation of ditto.

off which a strap leads to a small rigger on the saw-spindle. Now by this method the fly-wheel is never going fast enough to act as it is intended to do, unless the man who turns it does so at a terrific rate, and such a rate will soon knock up any man; and this, I think, is the reason why the hand circular saws are not more used than they are. Now look at the method which I recommend, and see which looks best.

The man turns a light wooden wheel (B) (the same letters apply to all the figures); off this a strap leads to a small wheel (C), the spindle of which runs through the bench and carries a large cog-wheel (D), and this engages with a small pinion (E), which is mounted on the saw-spindle, and which spindle is continued beyond the pinion so as to carry the fly-wheel (F). Now if the driving wheel (B) is 3 ft. in diameter, and the small wheel (C) 1 ft., and this in turn carries a cog-wheel 1 ft. 9 in., and this drives a pinion $4\frac{1}{2}$ in. in diameter, we are sending round the fly-wheel at the rate of about thirteen times to one turn of the driving wheel, as against once in the ordinary way; and this will give a great deal more power, without a corresponding amount of hard work, though of course there will be a certain amount of friction to get over, but if the bearings are well fitted, this will not be much; at any rate, it is nothing compared with the advantages to be gained.

One objection which will be made to this method will, no doubt, be the cost of the wheels required. This can be got over by using wooden wheels for the driving wheels (B and C), a method of making which I will describe before I close the paper; and anyone who is living in either an agricultural or in a manufacturing district will be able to get the cog-wheels and also the fly-wheel cheaply second-hand, and may also be able to get the necessary spindles and bearings as well; but if this is done, the whole must be obtained before the frame is made, so that the bearings, etc., can be placed at exactly the proper places. It is for this reason that I did not make my drawings to scale, so as not to confine anyone to any size. It will be as well to bear one thing in mind: that the heavier the fly-wheel the easier it will run, and, at the same time, the stronger the frame of the bench must be. The drawings show the position of every bearing, so I will not trouble to explain them any further, but will describe the method of making the wooden wheels. First the 3 ft. driving wheel. For this take some 1 in. elm or oak and make a cross as in Fig. 8, halved together in the centre so as to be flush both sides; then strike out some pieces to a 3 ft. circle (1 ft. 6 in. radius), enough to reach round the wheel three times (Fig. 6 shows the best way to do this without wasting the board); then take four of the longest pieces and screw them to the cross already made, fitting them together in between the arms, or perhaps I should say spokes; then turn the wheel over and fit a short piece between each of the spokes, crossing the joints of the other circling pieces, and screwing them firmly to them; then screw another circle all round, again crossing the joints; now screw a piece on each side in the centre, and the wheel is done. A section of it is shown in Fig. 7. An iron plate can be screwed on each side in the centre to take the spindle, or the wheel will soon run out of truth. We have now a wheel 3 in. thick, on which a strap will bite as well or even better than on an iron wheel. The small rigger (C) will be made in the same way, only of course it will be made solid in width, not thickness, and it had better have an iron plate as well on each side, to take the spindle.

If the cog-wheels are difficult to obtain, they can be dispensed with by placing the wheel C at the extreme end of bench, and having another wooden wheel on the other end of spindle, and a smaller one on saw-spindle, and connecting the two with another strap; and even the fly-wheel could be made of wood, and weighted at the rim, by nailing sheet lead round. But I do not recommend this way, only it may be useful for those whose pockets are light, and who may have time on their hands.

All the wheels, etc., in their places, the top can be put on. This should not be less

than 1⅛ in. thick, and should be planed off smooth and true, and a piece should be made to lift for the purpose of changing the saw when required. This piece is shown at G (Fig. 5). A simple form of fence is shown in Figs. 9 and 10. H, H are iron brackets which are slotted on one arm, and a bolt passing through the slot and through top of bench fixes them in any position. I is a piece of wood about 2 ft. 6 in. long, which forms the fence. The bench can be used for grooving, rabbeting, tenoning, etc., by having pieces of wood of different thicknesses to fix on bench, so as to regulate depth of saw-cut. I could go on for some time longer, but as it is my desire to be brief, I will not take up any more space; at the same time, if I have passed any detail over too lightly, I shall be pleased to explain fully in "Shop" to anyone who wishes for explanation. I trust I shall have no mere carping critics ready to find fault with my proposal before endeavouring to make the article and give it a trial. I hope, too, that no one will be deterred from asking for information, as I shall be very happy to give any in my power, and I am sure all those who follow my advice will never regret the day when they cast aside the old rip saw and made a hand-saw bench.

BENT IRON WORK, AND HOW TO DO IT.

BY J. H.

Bowl and Lamps.

Suspended Bowl—The Supporting Bracket—The Supporting Link—The Bowl—The Bottom of the Bowl—Suspension Lamp—The Supporting Link—The Copper Flowers—The Disc—The Suspension Chains—Bracket, or Wall Lamp—The Back—The Main Scrolls on the Horizontal Bar—The Main Scrolls that Support the Lamp Bowl—The Minor Curves—Suggested Modifications.

Suspended Bowl.—Fig. 43 shows a suspended vessel for the reception of ferns, flowers, grasses, etc. It is supported with brass chains; above is a star-like ornament, and a bracket sustains the whole. The only portions which are not made in bent iron are the chains, which are bought of an ironmonger or gas-fitter.

The Supporting Bracket.—Beginning with the bracket:—The outer framing (A) is made of bar, having a cross section of about $\frac{3}{5}$ in. by $\frac{1}{4}$ in. It is bent round and riveted, or brazed, by methods previously described. The sides must be quite straight, and the frame free from winding. The large main curves are well secured with clips to the framing. The smaller curves are well secured again to the main curves, and where they touch the framing to that also. This is a very plain bracket; I shall show one of a much more elaborate character in another article.

The Supporting Link.—The large link is made as follows:—A central bar (B) of iron, of about $\frac{5}{16}$ in. or $\frac{1}{4}$ in. square, is tapered down at each end and turned round to form a hook. This operation is shown in detail in Fig. 44. At A, one end of the bar is seen tapered down. This is done by hammering it while red hot, or by grinding, or by filing. At B it is seen partly turned by hammering round the mandrel (C). At D the hook is seen completed round the mandrel. Upon each flat face of this bar a symmetrical arrangement of scroll-work is fastened with clips. There are seven separate pieces of iron in each set, bent as shown, and fastened one to the other with clips. From the bottom hook of the star the three chains depend, and from these the ornamental bowl is suspended. It is made thus:—

The Bowl.—Two rings (C and D) of $\frac{1}{8}$ in. square iron are bent round and brazed with scarfed joints. The bottom ring is of smaller diameter than the top one, say by from 1½ in. to 2 in. To the rings (C and D) the scrolls (E) are riveted or soldered, or fastened with wire, crossing diagonally. The scrolls are of stout iron, say $\frac{1}{4}$ in. by $\frac{1}{8}$ in., or $\frac{3}{8}$ in. by $\frac{1}{16}$ in. The ornamental bent iron around the bowl is formed of ten similar sections. These are prepared separately, and fastened with clips both to the rings C and D, and to each other. The precise form of the curves is obtained by dividing the lengths, which are equal to the circumference of the circles A and B, each into ten equal parts; and a middle imaginary circle midway between A and B, also into ten equal parts, when the lines drawn through these three points of division will be the bounding lines of the curves. Ten similar sections, bounded by these lines, will, when united, form the outline of the bowl.

The Bottom of the Bowl.—The bottom of the bowl can be formed in various ways. The simplest is that shown in Fig. 45, in which a number of similar double or C curves are united to the bottom ring (B), and to each other, with clips.

Suspension Lamp.—Fig. 46 illustrates a suspension lamp. It is suitable for hanging in a passage or hall, either from a bracket, like those already illustrated, or from a hook only, secured to the ceiling. There are three suspension chains, which are formed wholly of ornamental links. Four chains may be used instead if preferred. The details of the work are as follows:—

The Supporting Link.—Beginning at the top, there is first the large short link (A). The central stem is made of rod, $\frac{1}{4}$ in. or $\frac{5}{16}$ in. square, and the thin iron strips are of the same width as the rod, and the ends are tapered down and bent round as described in connection with the similar ends in Fig. 44. The scrolls (B), eight in number, and precisely alike, are fastened to A with clips. From the point of contact of the curves with each other the copper flowers (C) stand out upon their stems, made and fitted as follows:—

The Copper Flowers.—These are made of copper in quite a conventional fashion. Little discs of thin copper of about 20 B.W. gauge are cut out either to a truly circular form (Fig. 47, A), or with shallow waved margins (B), or with deeply dentated margins to represent petals (C and D). A slit or a hole is punched in the middle of each, and then the copper is hammered into a hemispherical, or a nearly hemispherical, form, upon a cake of cement; or if there are a good many flowers of the same size required, a concave mould of hard wood, or of metal, may be used, and a punch with a convex end of the same size as the concavity of the flower may also be used to expedite the formation of the flower, and it will be smoother, cleaner, and more free from bruises if so made. The central part of the flower, in this case supposed to represent stamens, is formed of a flat bit of thin copper (Fig. 47, E), and the stem is a prolongation of this, and passes through the slit punched in the disc. Of course this is very conventional indeed, but nevertheless the grouping of these rude copper flowers is very effective among the black iron. I will, however, show some more elaborate ones in later illustrations. The advantage of these flat stems over those of round wire is that they can be clipped with less trouble between the flat iron curves. It is a considerable advantage in this case that the clips which connect the scrolls (B) at their points of contact also embrace the stems of C between them.

The Disc.—To A is attached the disc D, from which the suspension chains depend. This is formed of a disc of sheet iron, or of copper of about 14 B.W. gauge. Its edges may be left circular and regular, or waved or toothed. It is then dished by hammering. A ring (A) is riveted through a hole in its centre to receive the bottom hook of A. Three other rings are riveted at B, B, B to receive the eyes of the top links of the suspension chains.

The Suspension Chains.—The suspension chains (E) consist almost of a repetition of one pattern like that from which the whole is suspended, but smaller, as shown, so that the link may be taken as an enlarged view of the chain links, but for a slight variation in mode of curvature of the links of which the chains are composed, and the description given above will apply to each. The central bar for these links will not be more than $\frac{3}{16}$ in. square, and will do very well if an $\frac{1}{8}$ in. square only. The thin iron strips must be of the same width. Four links are shown in each chain, but the number will depend upon the height from which the lamp has to be suspended. The eyes of the three bottom links pass through rings which embrace the scrolls (F) that carry the lamp. The scroll-work is shown enlarged and separated in Fig. 48. There is a main scroll (F) and four minor scrolls (*f*, *f*, *f*, *f*). There is also a copper flower coming out at *g*, made as just now described. The scrolls are curved closely round the bowl of the lamp, and are united at top and bottom to the rings G and H respectively. The ring G encircles the lamp bowl immediately underneath the beading (*h*); the lamp is, therefore, supported by the ring G. Wire crossing diagonally will be made use of to unite the ring G to the scrolls F. The ring (H) beneath ties the scrolls together at the bottom, and is fastened with crossing wire.

The glasswork of the lamp is a matter that need call for no remark. There are the chimney and shade, and the smoke glass above.

Bracket, or Wall Lamp.—Fig. 49 illustrates a lamp mounted to fasten against a wall for passage or bedroom. There is a fair amount of work in it, and I introduce some floral ornaments into its decorations. Any lamp may be used, but it is better to use one having a copper bowl.

The Back.—For the back (A), get a piece of stout hoop iron of about 14 B.W. gauge; taper off the edges at the ends, and bend them round to form broad scrolls. Drill and countersink holes at *a*, *a*, to receive the screws which hold the bracket to the wall. Into this back, tenon with a square tenon, and rivet over the horizontal bar (B); or turn one end of B upwards as at *b*, and rivet it into A. At the other end the bar is turned up for about 2 in. to receive the attachment of the lamp supports. The size of this bar should not be less than $\frac{5}{16}$ in., and would be better of $\frac{3}{8}$ in. or $\frac{7}{16}$ in. square. It should be square, in preference to circular, to receive the top and bottom series of bent-iron curves, which stand opposite each other upon its two sides. The width of the thin strips will be the same as that of the bar.

The Main Scrolls on the Horizontal Bar.—On each of the two faces there are two main scrolls, C and D. An encircling clip will unite each series to B. A rivet or some solder will unite C C to A.

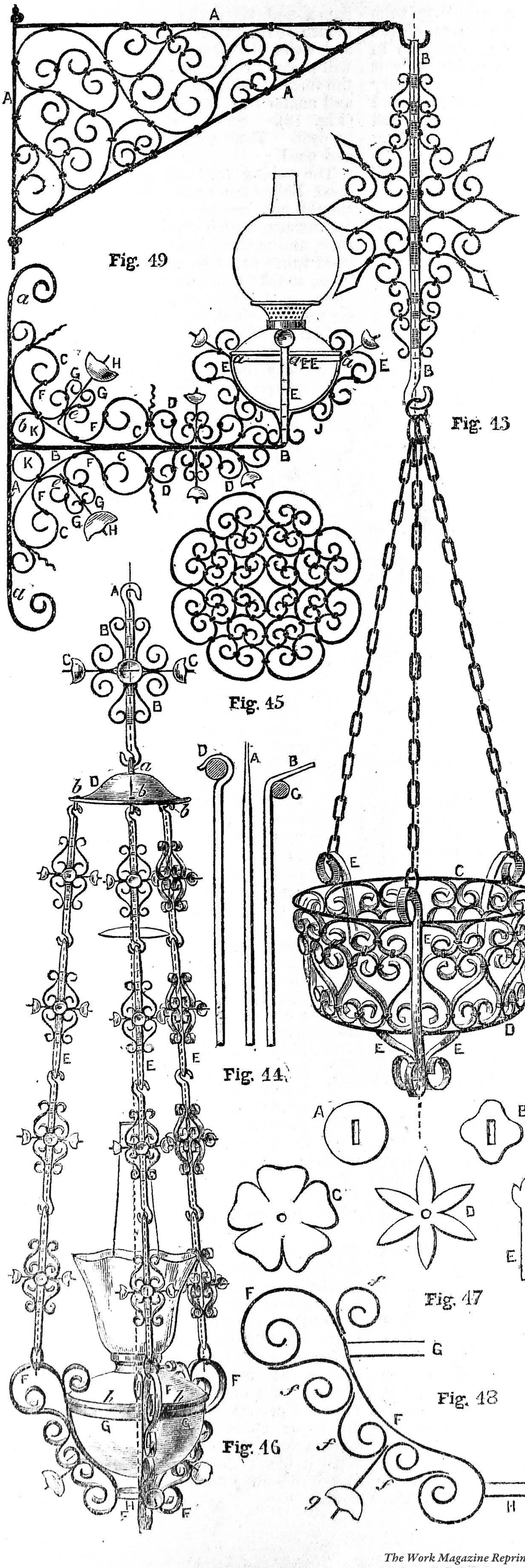


Fig. 49

Fig. 45

Fig. 44.

Fig. 47

Fig. 48

Fig. 46

The Main Scrolls that Support the Lamp Bowl. — The lamp bowl is united to B thus :—Four strips of stout iron (E), say, $\frac{3}{8}$ in. by $\frac{1}{16}$ in., are curved to fit the outline of the bowl. They are prolonged to embrace the turned-up stem of B below, to which they are riveted with two rivets passing through each pair of strips. At *a* the curves are fastened to the encircling ring (EE) with crossing wire. This completes the framework of main curves.

The Minor Curves. —Taking the minor curves, those which are attached to C and D are similar, except as to size. The curves F, G are typical of those attached to D. F, F are each fastened to C at two points with clips, and to each other at *e*. G, G are also fastened to F, F, and to each other at their points of mutual contact. The stem of the copper flower (H) is also embraced between F, F and G, G, and secured with the clips that hold F, F and G, G together at their points of mutual contact. Small circles are inserted at K, K, and tendrils at various places. Small supplementary curves are shown at J, J ; where they come in contact with the curves D they will be fastened with wire ; at other parts they will be secured with clips.

Suggested Modifications.—In this, as in other examples of bent iron work which I have given, it should be remembered that the amount of work may be increased at pleasure, in some cases diminished, according to the workman's leisure and taste. I have shown, as a rule, comparatively simple examples. But I have seen many specimens that are simply smothered with elaborate and overflowing wealth of ornament in consequence of the multiplication of similar parts. In this bracket lamp, for example, while I show two series only of curves, one above and the other below the bar B, four or eight such series might be used. The series of four might stand at right angles with each other on the four sides of the bar. The series of eight would be fixed at angles of 45° with each other. Alterations of this character my readers can make for themselves to suit their individual tastes, and to make the amount of work harmonise with their leisure.

Bent Iron-Work. Fig. 43.—Suspended Bowl. Fig. 44.—Method of bending Eyes of Link. Fig. 45.—Bottom of Bowl. Fig. 46.—Suspension Lamp. Fig. 47.—Floral Ornaments in Copper. Fig. 48.—View of Scroll-work that supports the Lamp Bowl. Fig. 49.—Bracket, or Wall Lamp.

CHEMICAL APPARATUS: HOW TO MAKE AND USE IT.

BY H. B. STOCKS.

RETORT STAND : METHODS FOR MAKING—RINGS—RINGS MADE FROM WIRE — DEFLAGRATING SPOON : EASILY-MADE FORM — TEST-TUBE : HOW TO MAKE, KIND OF GLASS REQUIRED—TEST-TUBES USED FOR PREPARING GASES : OXYGEN, SULPHURETTED HYDROGEN, ETC.

I HAD intended in the present article to devote the whole of my time to another lesson in glass-blowing on a small scale, but I find that there are one or two articles required before we can properly perform the experiments connected with oxygen and hydrogen. I shall therefore describe these first, as I wish to follow as nearly as possible the order usually followed in teaching chemistry.

We are in want of a retort stand and a deflagrating spoon.

A retort stand with three rings will cost about 4s. 6d. It is possible that you may find a stand at a marine store dealer's that will answer the purpose ; or get an iron moulder to cast a rectangular iron base, 6 in. by 4 in., and hollow (Fig. 1). A piece of $\frac{3}{4}$ in. gaspipe, 18 in. long, will do for the rod. Drill a hole in the stand 1 in. from the side. Get a 2 in. bolt and nut, file the head of the bolt smaller, until you may just hammer it into the pipe, leaving about $\frac{3}{4}$ in. of the bolt out ; and having pushed the bolt through the hole in the stand, screw the nut up tight until the rod stands upright and rigid.

In place of this you may have the stand and rod solid, with a hole in the stand tapped and a corresponding thread on the rod, which will make a very solid stand ; but for those who do not want to go to any expense at all, I advise them to get the lid of a tin canister, 6 in. by 4 in., or near that, fill up the lid with melted lead, and, after cooling, bore a hole, of less than $\frac{3}{4}$ in. diameter, right through the lead down to the tin and hammer in the piece of $\frac{3}{4}$ in. pipe.

This will do for the stand ; now we want rings. These also will have to be cast. They may be of iron or brass, and require thumbscrews to grip the retort stand. You might try Caplatzi, who advertises in WORK, for these and any other articles required.

Rings may be made of stiff iron wire, and will do quite as well as any. Three sizes will be useful—4 in., 3 in., 2 in. Having procured some very stiff iron wire, cut off three pieces of it, and bend each one of them around some cylindrical body of the size required, so as to form a ring ; bring up your stand, and commence winding the loose end of the wire around the rod, four or five coils close together ; and wind on very tight, so

that the ring may stand horizontal, and with about 2 in. of wire in a straight line before coiling. The rings should have their centres all in the same plane, so as to hold apparatus in a proper manner. If the wire is sufficiently stout, the rings ought not to bend appreciably under the slight weight they have to bear. By pressing downwards or upwards on the rings close to the stand they will easily move, but simple pressure of an apparatus on the stand tends rather to make the rings grip harder.

The deflagrating spoon (Fig. 4) is used for burning substances in various gases, the substance to be burnt being placed in the small cup.

The deflagrating spoon consists essentially of a small metal spoon, which is riveted or brazed on to a stout iron wire. The latter passes through a cork in a circular piece of tinplate, intended to cover the jar containing the gas to be experimented upon, and thus prevent, as much as possible, fumes from the burning substance entering the room.

Fig. 6 shows a device for a spoon where brazing or riveting will not be necessary. The little cup is made from a piece of sheet-brass $\frac{3}{4}$ in. square, in which are punched two small holes at opposite corners. The corners may then be turned up. The tinplate cover is 3 in. in diameter, and in the centre of it a hole is punched, the hole being fitted with a cork, through which passes the iron wire (16 in. long), bent as shown (Fig. 6), and to the end of which the small brass cup is connected by means of a piece of thin iron wire. There should be no difficulty in making this piece of apparatus, and the materials are to be found in almost every house, so that the cost should be practically *nil*.

I shall now endeavour to give a few more practical details in glass-blowing on a small scale, and for this purpose have selected the test-tube as a good example. I should not, however, advise anyone to make their own test-tubes—they are so cheap—but for our purpose we could have no better example than this simple and largely-used piece of apparatus (Fig. 9).

Cut a piece of the tube, $\frac{5}{8}$ in. diameter, 12 in. long. Now, tube of this size may not always be cut in the manner shown for tube of a smaller diameter. To cut it neatly and at the place required, make a file-mark (it need not extend around the tube); select a short piece of the glass rod, and draw it out in the blowpipe flame to a point; heat up the pointed end of the rod, and immediately place it upon the file-mark on the tube. Take care that the tube is held close to the bench over a duster, as this procedure usually cracks the tube right around, and the portion unheld falls; if not, the crack which forms may be led around the tube by moving the hot rod in front of it. This property of glass is very useful, and I will show how it may be utilised later on. Having cut off a portion of the tube of the required length, commence heating it at the centre in the blowpipe flame very gently, as thin tube like this rapidly fuses—a rather smoky flame is best—and as soon as the tube is sufficiently soft, withdraw your hands from one another in a horizontal direction, first removing the tube from the flame. The tube will now consist of two large tubes, connected together by a capillary tube (Fig. 10). Turn down the flame of the blowpipe, and blow at the point shown in the figure; and, as the glass melts, draw it away. The tube with the long capillary may now be laid down for a short time, and the first tube proceeded with before the end has had time to cool. Continue heating the closed end of the tube until it rounds off (as at Fig. 11), and has a small bulb of glass in the centre. This latter has to be removed. Turn the blowpipe very low, and hold the tube in such a position that the knob of glass only is heated to redness, and proceed to remove it by touching it gently with a cold glass rod and drawing away the melted glass. Repeat this until the knob has entirely, or almost entirely, disappeared. When this is the case, turn up the gas, and, having the flame rather smoky, as before, heat the bottom of tube gently; remove from the flame, and, holding the tube vertically, blow gently into the open end, twisting the tube all the time, so that the bottom may be blown out into a nicely rounded shape. Repeat this until the desired result is obtained; smoke and cool.

While the tube is cooling, proceed with the second one. Heat the tube in the same position as you did the first one, and draw away the capillary tube; then proceed as above.

To finish off the tubes, we require a piece of charcoal sharpened to a rough point (Fig. 12). A piece of hard charcoal, about $1\frac{1}{2}$ in. diameter, will do.

Now heat up the mouth of one of the tubes, very gently at first, and turn constantly, so as to have it equally heated. When sufficiently soft, withdraw from the flame, and place the charcoal cone in the mouth of the tube. Press upon it slightly, and twist the charcoal once round. This will press out the mouth of the tube into the form of a lip, and will render it stronger and neater than if left in its rough condition (Fig. 13). Smoke the tube, and allow to cool. The tubes may then be washed and used.

The tubing for this purpose should be good Bohemian tubing, and, upon heating, should not become covered with a frosted appearance, which would show it to be bad tube, and entirely unfit for the purpose. No good tubes could be made from this kind of glass, so take care you get tube of Bohemian glass, as I have come across many bad specimens, which have led to nothing but failure for glass-blowing purposes.

Test-tubes come in very handy, not only for testing, but for many other purposes. They may be used for preparing small quantities of gases. Fig. 14 shows a test-tube used to prepare a small quantity of oxygen.

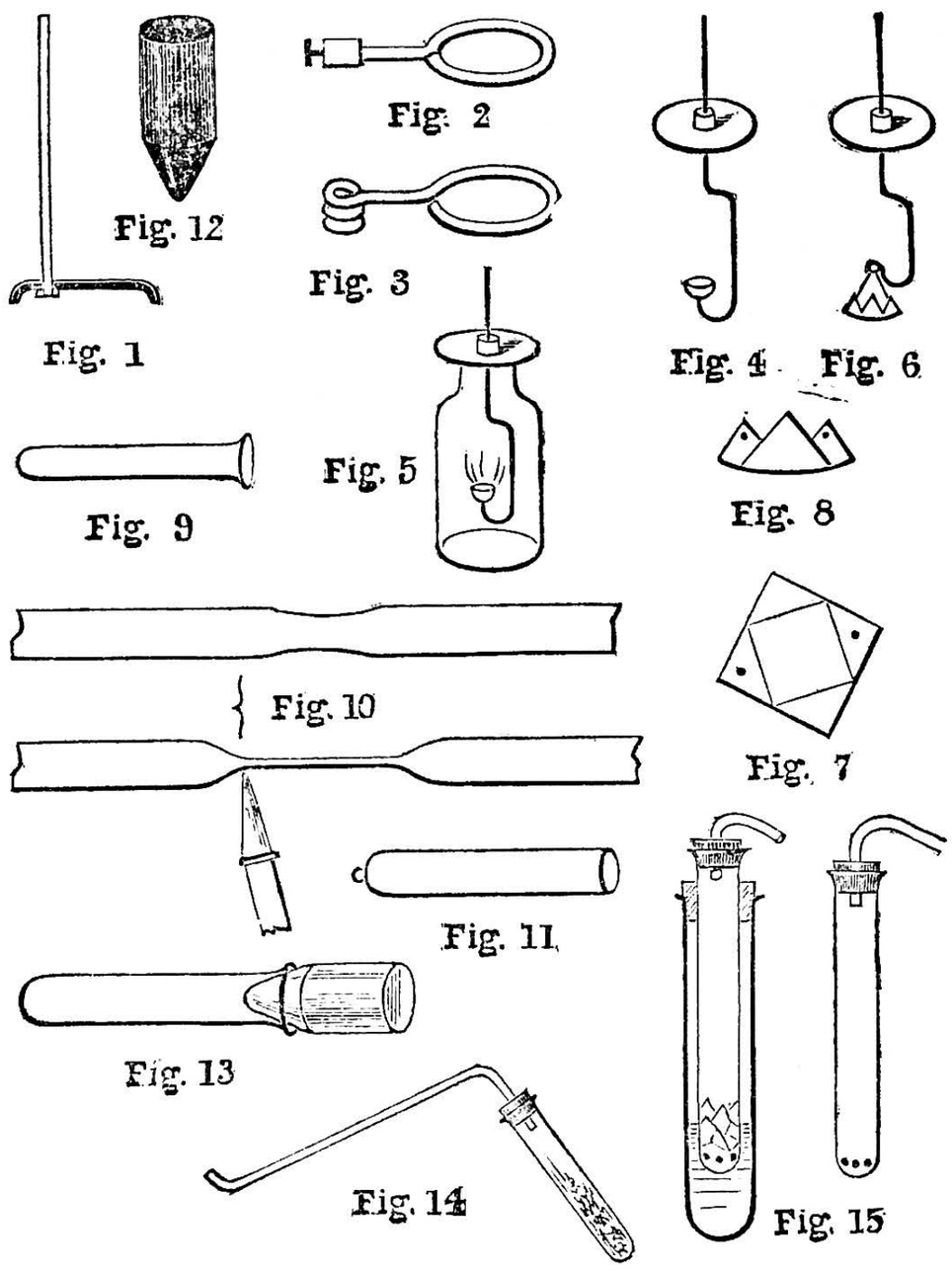
Fig. 15 shows an apparatus for preparing hydrogen, sulphuretted hydrogen, etc., and is specially useful for preparation of small quantities of the latter gas for testing purposes, as the supply of gas is under control.

The apparatus consists of two stout test-tubes—the outer tube 1 in. diameter, the inner tube $\frac{5}{8}$ in. diameter, and preferably as long as the outer tube.

Heat up the bottom of the smaller tube in the blowpipe flame, and when it is sufficiently soft, pierce it with four or six radial holes by means of a darning-needle; smoke and cool.

Two corks are required—one fitting the outer tube, bored with a hole large enough to take the inner tube easily. Soak the cork in melted paraffin-wax after cutting the hole. The second cork fits the smaller test-tube, and is bored and fitted with a bent delivery-tube.

Place the acid in the larger tube (about quarter full), put in the cork, and slide in the smaller tube. It will be found that the wax coating assists this. Place the sulphide of iron in the inner tube, sliding it in with the tube held at an angle; otherwise, the bottom of the tube will be knocked out. Now, by pushing the inner tube down into the acid, the latter penetrates the holes and attacks the sulphide, with an immediate evolution of sulphuretted hydrogen, which may be immediately stopped, when required, by raising the tube out of the acid.



Chemical Apparatus. Fig. 1.—Section of Retort Stand, with hollow Foot. Fig. 2.—Cast Ring. Fig. 3.—Wire Ring. Fig. 4.—Deflagrating Spoon. Fig. 5.—Substance burnt in Gas. Figs. 6, 7, 8.—Easily-made Spoon. Fig. 9.—Test-tube. Figs. 10, 11, 13.—Method of making Test-tube. Fig. 12.—Charcoal Cone. Fig. 14.—Tube Apparatus for Oxygen. Fig. 15.—Tube Apparatus for Sulphuretted Hydrogen, showing Inner Tube.

MICROSCOPIC DRAWING.

PLACE the body of the microscope horizontally; remove the mirror; put the slide on the stage; condense the light upon it by means of the bull's-eye, taking care to centre the light; attach the concave mirror to the front of the eye-piece by means of a spring or a piece of thin wood. Have its surface at an angle of 45° with the plane of the anterior glass of the ocular. This will project an image of the object on the paper beneath. If the outer ring of light is circular, there will be no distortion. With a black cloth exclude all outer light, covering both your head and the instrument.

NEW SELF-LIFTING COUCH-RAKE.

BY J. CHARLES KING.

Of the many troublesome weeds which are the pests of the English farmer, couch-grass —or "quitch," as it is sometimes called—is the most difficult and costly to eradicate, unless the proper method be adopted. Couch-picking on the surface does rather more harm than good, as the rootlets are left in the soil to start a new career.

The couch-rake about to be described was used on the farms-in-hand of the Duke of Somerset, Bulstrode Park, with conspicuous success in results and economy of cost of working.

Its make and action are as follows:—A triangular frame of iron, 8 ft. back beam and 11 ft. sides, running to an apex, where an upright socket took the spindle of a swivel-wheel, 12 in. diameter. Two hind wheels, each 20 in. diameter, upheld the back beam by means of axles, which are adjustable up or down a slotted groove at each end of beam. So far it is as a triangular trolley-iron, 3 in. by $\frac{5}{8}$ in. in section.

The rake-head, made of 2 in. stout L-angle iron, had teeth 12 in. long by $\frac{3}{4}$ in. wide, with the shoulders mortised through one angle side and riveted to the other, as is done with iron garden rakes. These teeth are 2 in. apart, so that there are forty-eight teeth in the 8ft. rake-head. To make this rake-head always self-lifting is simple enough.

From the top side of the apex of the frame were fixed two long three-plate springs, each 3 in. wide and $\frac{3}{8}$ in. thick, that extended to the beam end, spreading out to within 1 ft. of each end of the rake-head, and fixed there, to hold it one foot above the beam. When the rake-head is fixed to the springs, its weight depresses the flexible ends of the springs, bringing the teeth-points just below the line of the beam. There it hangs ready for action, when pressed down by foot or hand, or both, to do its extirpating work; and the instant the hand or foot releases it from downward pressure into the soil, it flies up to the end "check-stops" on the beam with a recoiling clash, that knocks off the weeds and couch, earth and stones, that may cling to the teeth.

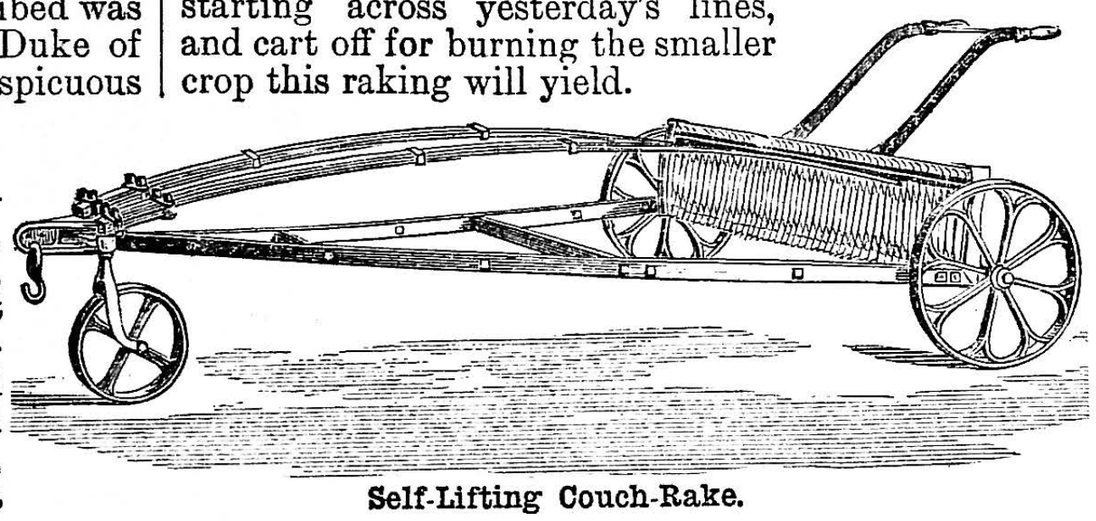
To ensure thorough cleansing, just in front of the beam and the rake-teeth is an extra beam of lighter iron, which scrapes the front of the teeth of the rake in its upward spring, or recoil. This is not shown in the sketch. The handles fixed to the rake-head stand up and back about 30 in., with a round bar of wood, 3 ft. long, joining them for the hand-pressure of the driver.

A footboard of iron stands out from the rake-head for foot-pressure, or for standing on when the rake is wanted to scour deep into the soil.

The teeth are slightly curved on their length, and skim about 5 in. from a vertical line. For extra foul land, a five-tined dung-fork is carried on top of the handle for cleaning the teeth of the weeds and earth. It is pulled by a horse, led by a boy at a slow pace; but the rake-man must be nimble and methodical, so as not to let the rake be more than an instant out of the ground, and that only when in a true line, at right angles to the rakings. This line has to be cross-raked, so that no part of the field is missed.

Eight acres may be more thoroughly done in one day with this rake than would be the case were eight men to fork over one acre in the usual way; hence its obvious economy for the purpose intended.

Having got the couch roots to the top of the ground, do not leave them there long, but cart at once; sowing the land again by hand-picking is wasteful cost. With close-tined dung-forks, lift the couch-grass into carts—particularly all earth that clings to the roots: for in these are the most potent couch rootlets. Burn the lot. The next day, if fine weather, work the same ground, starting across yesterday's lines, and cart off for burning the smaller crop this raking will yield.



Self-Lifting Couch-Rake.

For the most effective use of this rake, the land should be in good tilth after ploughing and harrowing—if with the circular harrows, that rotate as they advance, a thorough cleansing will be the result. These neglected harrows are strongly advocated. The man who farms well under the ground will be well helped by Nature above ground; and if acquainted with the laws of master-growth of crops and weeds, he will put in the couch-weed's master-growth—sainfoin—if the land is suitable and in good heart. The roots of the sainfoin will kill and feed on the little amount of feeble couch-root growth that may be left in the soil after the use of the couch-rake.

HOW TO REPAIR A SLATE ROOF.

BY E. DICKER.

Before laying out any money on whitening ceilings or papering walls, especially in those rooms directly under the roof, I should strongly advise a thorough examination of the roof, to see if there are any broken or displaced slates, as there are very likely to be during the frosts, etc., of winter. If there is a slate loose or broken, the wet is sure to come in *after* you have whitened the ceiling or papered the walls. I can speak very feelingly upon this point, as the very thing occurred to me only last summer.

Fig. 1 represents a portion of a slate roof, and we will suppose the slate marked A is broken, so that the water which goes through the joint between B and C finds its way through that, between the upper part of D and E, and from there runs down the boarding or rafters, and shows itself on the ceiling below near the walls, or it may fall direct on the ceiling below the broken slate.

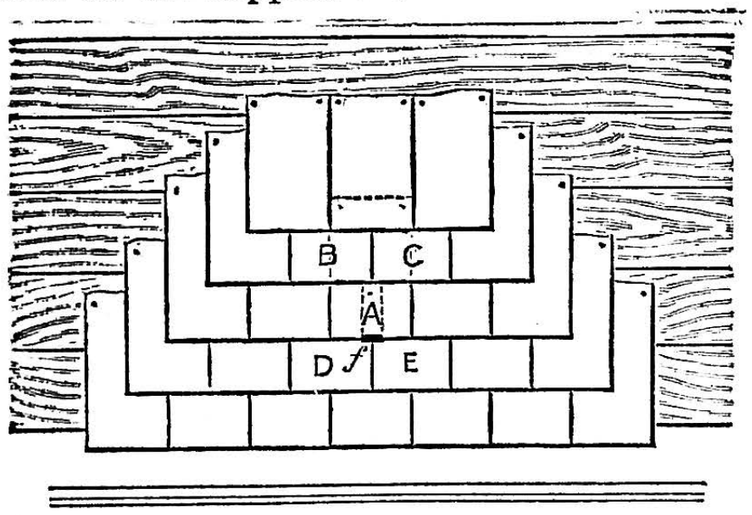


Fig. 1.

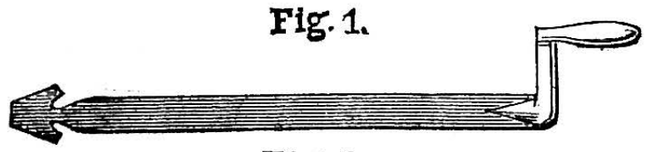


Fig. 2.

Slate Repairs. Fig. 1.—*f* shows appearance of Metal Slip when new Slate is in. Fig. 2.—"Slate Rip."

To put in a new slate, it is first necessary to take out the broken pieces of the old and the nails that held it in position, or else you cannot push the new slate into its place. You will at once see that to get at the nails you would have to take up the slates B and C; and before you could take off these slates you would have to take off those above, and so on until you reached the top of the roof. Now, this would never do, for it means that you would have to strip nearly the whole of the roof to put on one new slate. What is done is to draw the nails from under the slates with a tool called a "slate rip" (Fig. 2).

The blade of the slate rip is pushed under the slates, and the head of the nail caught in one of the notches, and then, by giving the "rip" a sudden pull downwards the nail is pulled out; if the nail is held so tightly that it will not give, a sharp tap or two with a hammer on the front of the handle will soon draw it out.

A piece of stout hoop-iron with a notch made on it near one end, and turned up at the other to form a handle, will serve the same purpose as a special slate rip, especially if you have only one slate to put on. Sometimes it is found that the new slate will pass the heads of the nails and bed all right without taking the nails out at all; if this is so, no useful purpose is served in drawing them out.

You cannot nail the new slate in its place any more than you could draw the old nails out; so a strip of thin copper, lead, or zinc, about $\frac{3}{4}$ in. wide, is laid directly over the joint between the slates, D and E, and nailed to the boarding through the joint as close to B and C as possible, allowing it long enough to turn up over the bottom edge of the new slate when it is in position. The new slate is then pushed into its place over the metal slip, and the slip bent sharply up over the bottom edge of the slate, and so holds it there. For the sake of appearance, the slip is cut off as near to the bottom of the slip as you dare.

In measuring for a new slate, measure the width only—the length generally follows. For example: if a slate is 8 in. wide, it is generally 16 in. long; and if 10 in. wide, then 20 in. long; while if 12 in. wide, the length will run 24 in.; and so on.

WRINKLES.

Worms in Wood.—To remove worms in furniture, dissolve 2 dr. of corrosive sublimate in 2 oz. of methylated spirit and 2 oz. of water; to be applied freely with a stiff feather or brush. This is an unfailing remedy, but the mixture is poisonous, and therefore should be carefully labelled and kept out of harm's way.

To get Rid of Pot and Kettle Fur.—If the incrustation is confined to the spout, stop the inside orifice with a cork; fill the spout with dilute hydrochloric acid (to be obtained from any chemist); allow it to remain for about half an hour, and then clean out with a piece of cane; and if not entirely removed, repeat as before.

"WORK" PRIZE SCHEME.

NOTICE.

"WORK" COMPETITION COUPON

will be found on page 448.

NOTICE TO READERS.

Among the illustrated articles in next issue (No. 185) will appear :—

A Fancy Convertible Table.
Clock Water-Wheel Novelty.
Perspective in Drawing Furniture.
Helical Gears.
Æolian Harp Making.
Specula for the Newtonian Telescope.
Etc. Etc.

*** The Editor makes this intimation in the hope that readers, having friends interested in any of these subjects, will bring the same to their notice.

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"Aster" (S. M. Chapman), 11, Simpson Street, Newcastle-on-Tyne.
"Pater" (J. Charles King), Burchett's Green Cottage, Maidenhead Thicket, Berks.
"Forkless" (Mervyn W. R. Bunbury), 15, St. Mary's Terrace, Paddington, W.
"Dhobia" (Harry T. Baker), 14, Southgate Road, Kingsland N.

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In Column, per inch	0	10	0

Small prepaid Advertisements, such as Situations Wanted and Exchange, Twenty Words or less, One Shilling, and One Penny per Word extra if over Twenty. All Other Advertisements in Sale and Exchange Column are charged One Shilling per Line (averaging eight words).

Prominent Positions, or a series of insertions, by special arrangement.

*** Advertisements should reach the Office fourteen days in advance of the date of issue.

*** All letters suggesting Articles, Designs, and MS. communications for insertion in this Journal will be welcomed, and should be addressed to the Editor of Work, Cassell and Company, Limited, London, E.C.

Work and Wage.—"The labourer is worthy of his hire." The sacredness of these words is too often overlooked in the shameless advertisements of those who want to hire labour. Here are two samples out of many nearly as bad :—

Wanted, a teacher of technical classes ; efficient, painstaking, etc. Salary, £25 a year.

Wanted, a bailiff and gardener for seventy-six acres of land ; must understand stock and make himself generally useful, etc. A comfortable home in return for services.

These advertisements have been abbreviated for reference, but enough, and too much, is here to show the baseness of some would-be hirers of labour on such terms. Convicts get their food, lodging, clothing, and a deferred payment for exceptionally good conduct, but the sham British yeoman, who wants a capable man to give his lifetime for his food and lodging, is a disgrace to his order. The institution also that needs a talented expositor of the technics of various mechanisms and processes in manufacture for £25 a year deserves to be ended, and its accounts overhauled to find out if its officials are being paid a relative rate of salary to the one it offers for the services of a technical teacher. Even worse advertisements than those quoted make bids of a shelter and food for ladies to teach and train children of other people, for which they are expected to be proficient in music, drawing, and languages. All for a comfortable home! Home, forsooth! Such advertisers cannot know the meaning of the word. It may be a shelter for those sad creatures who, by adversity, are compelled to immolate their young lives, but morally it is a thief's den, where the poor teacher becomes the victim of *soi-disant* respectable people, who thus rob a girl of her life's brightness and her soul-joy of its charm. All noble-hearted men and women should steadily discourage this particular species of iniquity.

An Aim for Trade Unions.—It is being generally conceded by even the friends of labour that strikes are not a satisfactory method of arriving at an adjustment of disputed points between employers and employed. There is the suffering that never fails to accompany a strike, there is the abiding ill-feeling engendered whichever side wins, and there is the depletion of the coffers of the men's organisation. Now these funds might, we think, be turned to a better use ; and in view of the recent appearances of advanced labour leaders and co-operators on the same platforms, perhaps our suggestion may receive some attention. It is that trade unions should become co-operative distributors—not of tea and sugar and other articles, but of labour. Let each union be like a co-operative store, the commodity it supplies being labour. For example, a shipbuilder tenders for the building of a ship. To build this ship he requires, besides material, various classes of craftsmen — engineers, carpenters, sail-makers, riveters, and so forth. In preparing his tender, let him submit specifications of the work he needs to be done by these different groups of workmen to their unions, and let them thus tender to him for the work. In this way disputes during the progress of contracts, and their consequent damage to the contractor, would be avoided, all points having been settled previous to the signing of the different agreements by the unions. This risk, and the supervision of the men being withdrawn, contractors would be able to afford much greater sums than they now give to labour. The contractors would pay the unions the agreed upon amounts, and the unions would pay the men. By some such scheme as this all disputes about wages and hours of labour would lie between the men and the officers of their unions, and if the men were not satisfied with their officers they could elect others. There is no satisfactory ground upon which workmen can fight with capital—such a fight, besides being injurious to both parties to the contest, must always end by putting the men out of court. If an employer says to a demand for higher wages, "No : I shall not raise your wages," there is no power to make him do so. He can shut up his shop, and there the matter may end. All that the man can do, if he wishes to carry on his business, is to strike, picket his shop, and seek to injure him. Suppose an employer, because a man refused to work for him, determined that that man should not get work at all, and did all in his power to prevent that man from getting work, he would then be in the same boat as strikers often find themselves in. We hope our suggestion may be carefully considered.

Winter Work.—With the long evenings gradually creeping upon us, thousands of our subscribers will be parcelling out their winter's work. It will be our aim to help them very materially by providing a variety of subjects such as will afford scope, week by week, for the best energies of our varied classes of readers. Novelties and special subjects will be placed before "Workites," and it is hoped that any subscriber in need of a subject will make his want known. Meanwhile, the enlisting of new subscribers—of which the Editor will always be glad to have particulars—may be zealously pushed on by those subscribers who, not content with taking in Work themselves, very properly induce others to do so also. This is the way in which thousands who cannot write for Work can do their share in helping the publication.

THE ART OF STAIRCASING.

BY GEORGE F. CHILD.

STAIRCASE WITH HALF-SPACE OF WINDERS.

WORKING DRAWINGS — SETTING OUT THE STRINGS—OUTSIDE STRINGS — SETTING OUT THE NEWELS — SCALE DRAWINGS — MODEL NEWEL — CARRIAGE PIECES — BEADS, ETC. : METHOD OF BENDING — CUTTING OUT THE DRAWINGS.

Working Drawings.—The subject for our present lesson is a flight of stairs over a rather difficult plan, inasmuch as we have a wall, 4½ in. thick, occupying a position midway between the top and bottom flights. This is merely given as a good illustration of one of the many difficulties the staircase hand has to deal with. I may perhaps here state that this staircase (as all others in the present series) has actually been constructed by the writer, and therefore the drawings are placed before the novice in full confidence of their being correct.

The plan and elevation must be drawn as in all preceding examples, dividing the "height" and "going" according to the data given. It will be observed that there are six winders, occupying the whole width of the staircase. When this is the case, they are known as a *half-space* of winders. The reason for these winders will be readily understood when the measurements are taken, as explained before.

Setting out the Strings.—Fig. 1 shows a sectional elevation on A B, which, as we know, is obtained by projecting lines from

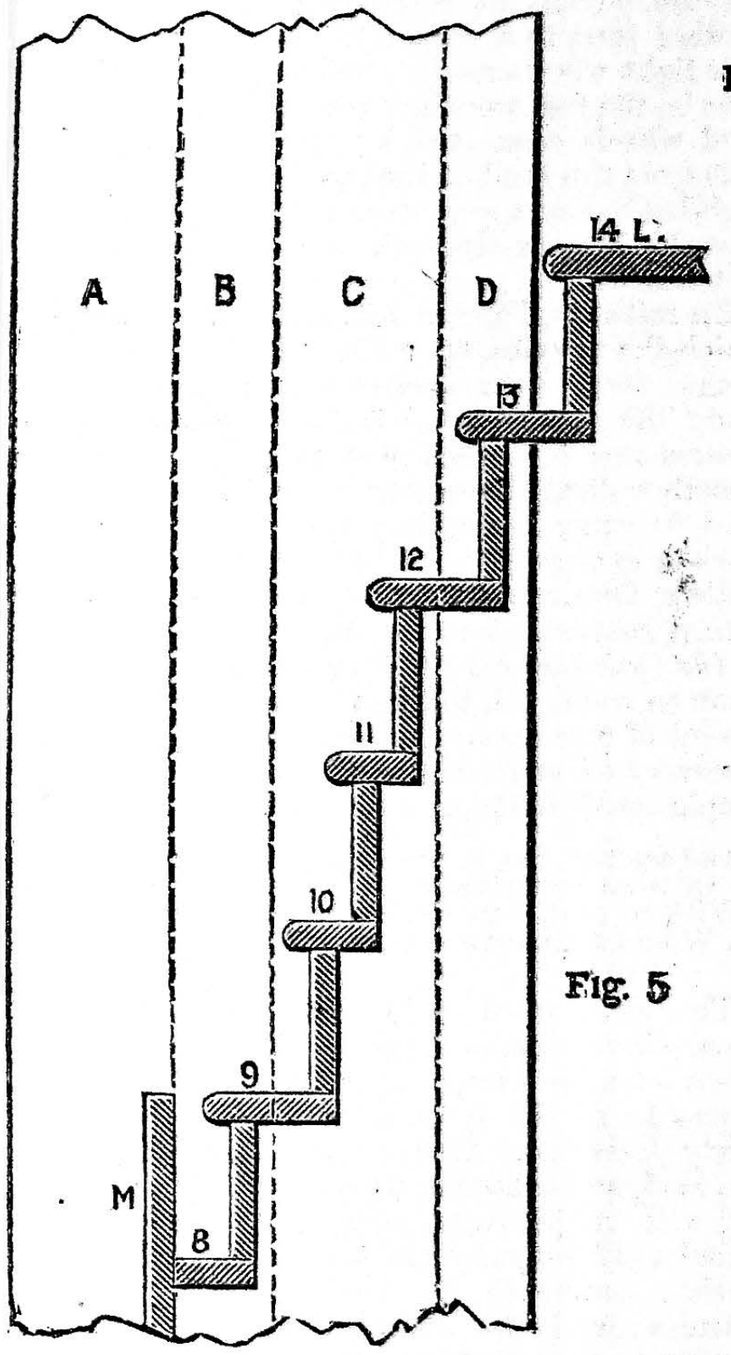


Fig. 5

Fig. 8

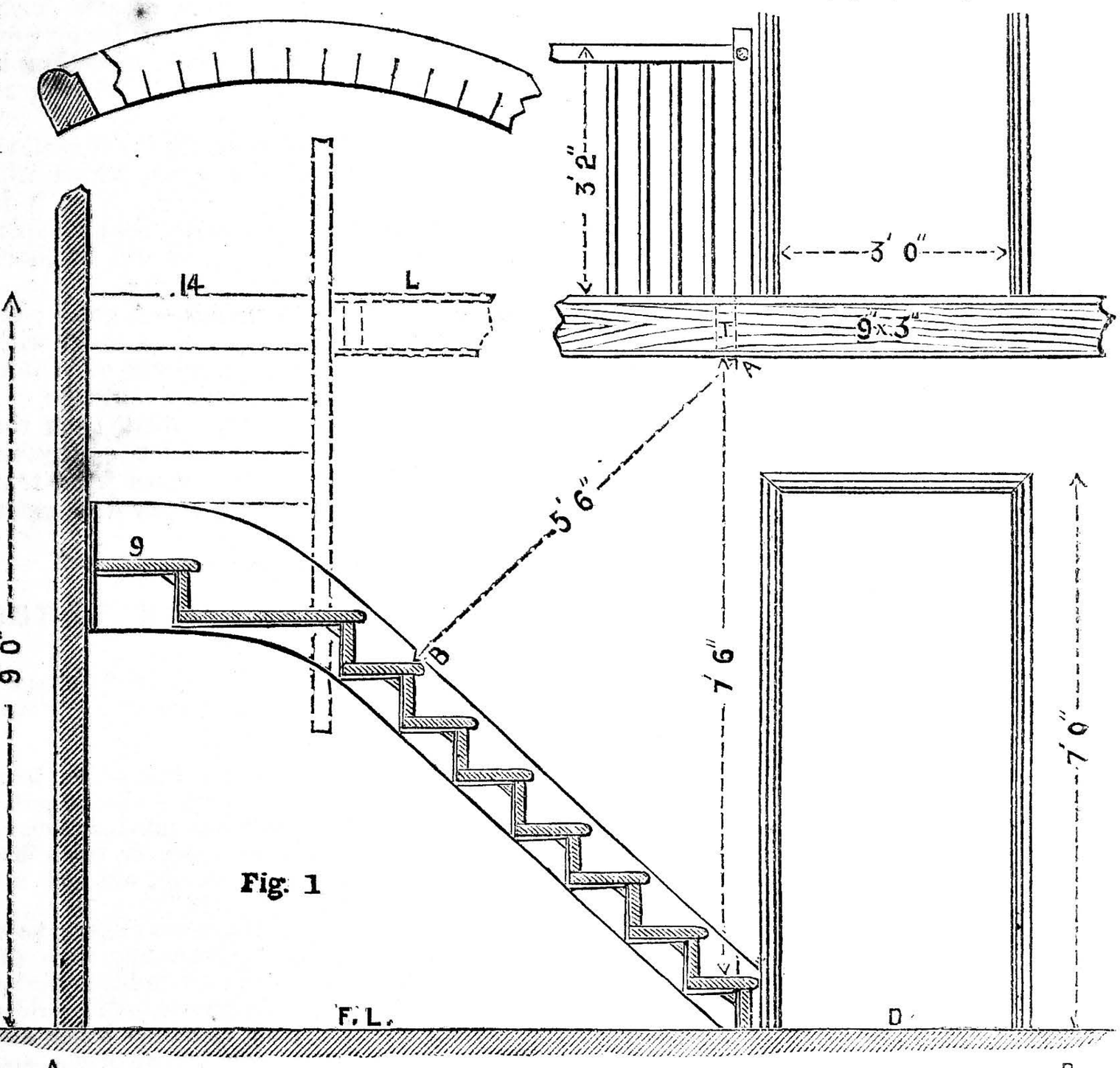


Fig. 1

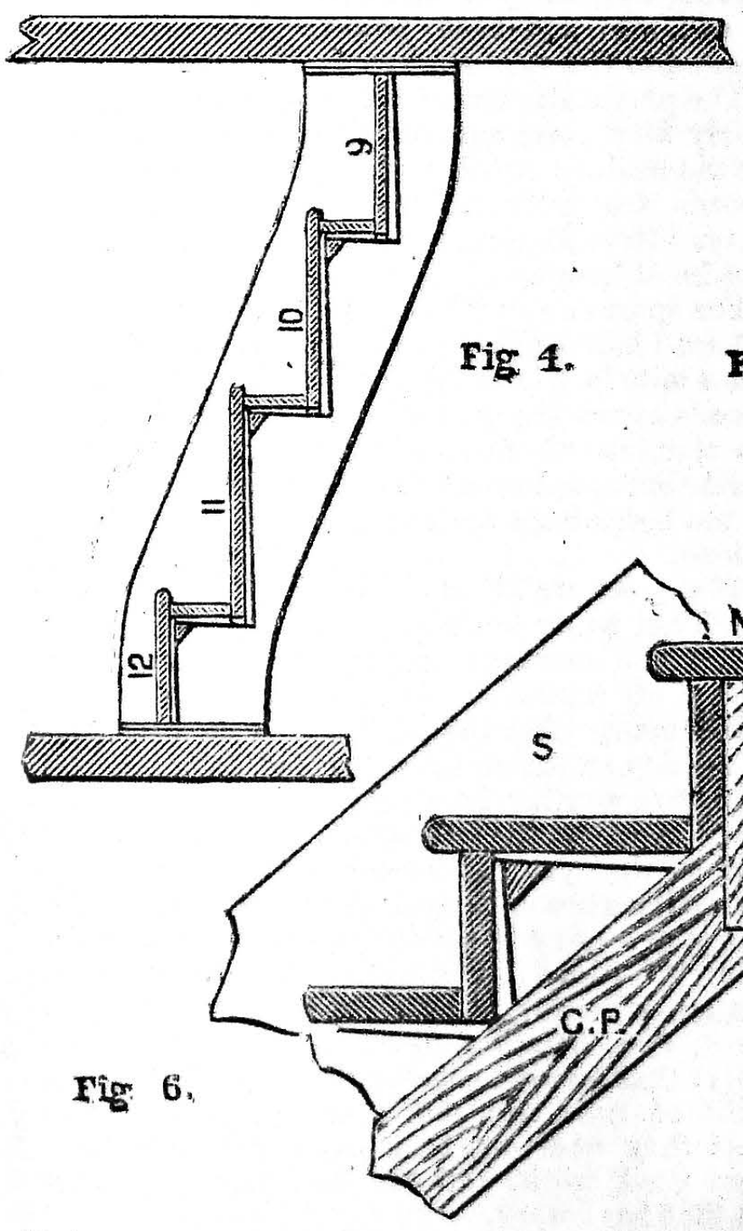


Fig. 4. Fig. 2

Fig. 6.

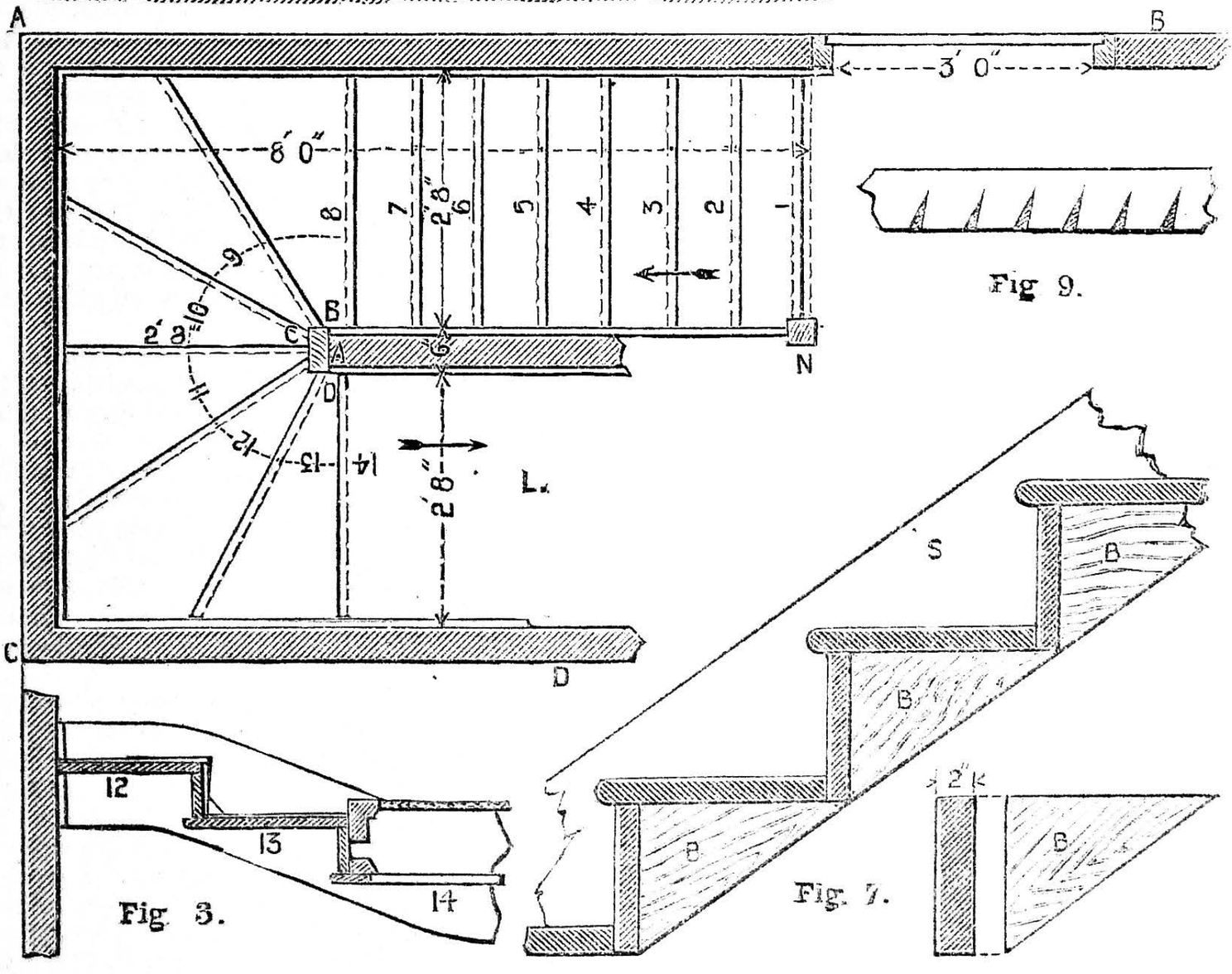


Fig. 3.

Fig 9.

Fig. 7.

Staircasing. Fig. 1.—Sectional Elevation—F L, Floor Line ; D, Door ; L, Landing ; T, Trimmer. Fig. 2.—Plan—A, B, C, D, Edges of Newel ; N, Newel ; L, Landing. **Fig. 3.—Sectional Elevation on C D. Fig. 4.—Sectional Elevation on A C.** Fig. 5.—Development of Newel—M, Mortise ; L, Landing ; 8 to 14, Ends of Winders ; A and C, Sides of Newel ; B and D, Edges of Newel. Fig. 6.—Diagram showing at C P Carriage Piece ; L, Landing ; N, Nosing ; S, String ; J, Joist. **Fig. 7.—B, B, B, Pitchboard Brackets ; S, Stringboard.** Figs. 8 and 9.—Method of bending Beads.

the plan, to intersect with the riser-lines. The dotted lines, 9 to 14, show the winders up to the landing. The portion of the drawing shown above the doorway (D) represents the door leading into the bedroom, with a part of the handrail, balusters, etc. This rail is returned on the landing at right angles to the staircase, a trimmer being inserted below, as at T. The distance from this trimmer to the nosing of our steps will require careful attention, as upon its being placed in proper position depends our ability to pass up and down the stairs without striking the head: this is known as *head-room*. It will be seen the distance in the present instance is 5 ft. 6 in., in a line perpendicular to the nosing-line, and gives 7 ft. 6 in. in a vertical direction. Correctly speaking, the distance between A and B should not be less than 6 ft. 6 in.; but, of course, we are entirely guided by circumstances, as it rarely happens that we are able to design the stairs as we should desire, on account of construction of the building not admitting it.

The strings at Figs. 3 and 4 are set out as before. Fig. 3 appears to be upside down, but is drawn thus to show it in proper position. If the paper were folded up round the plan (Fig. 2), all the strings in elevation would be shown in their proper position. This can easily be proved.

Outside String.—The outside string requires no explanation, being set out as all other examples.

Setting out the Newels.—Fig. 5 represents the newel developed—that is, each side of the newel is marked off as seen, the dotted lines being the angles. A is the side next the wall (see plan, Fig. 2), B the edge following, C the side facing the winders, and D the corresponding edge.

Scale Drawings.—I should advise the student to set out the plan of the *winders* to a large scale, say 1½ in. to the foot, dividing them equally on the centre line, which is, as we know, 15 in. from centre of newel; also mark them out equally *round* the *newel*, as seen in Fig. 2. Now develop the newel, as at Fig. 5, by first drawing the space marked A, which is 6 in.; next draw the space B, this being 3 in., and represents the edge of newel. Draw the following side (C) and edge (D) in the same manner.

Model Newel.—Now, at M, mark the mortise for the string, and draw the first winder, No. 8, on the edge B. By taking the respective distances from the plan, and transferring them to the development, we can mark each winder in its proper position—of course, marking the height of each step as we go. If the drawing is set out on a piece of cardboard, and a knife lightly drawn along the *dotted lines*, the model can be bent round, thus forming a miniature newel, and showing each winder in its true position. This may appear to be taking a lot of trouble, but as it is almost as good as setting out a real newel, the experience gained will give greater confidence when the actual work is taken in hand.

Carriage Pieces.—Where there is no spandril under the stairs, a carriage piece, C P (Fig. 6), is often introduced to stiffen them. This may be a piece of *quartering*, about 5 in. by 3 in., and is fixed to the floor at bottom and notched to the trimmer at top. This piece may be cut out to take the edge of each step: a better plan being to nail rough pieces on the side of the carriage piece, and letting them extend under each step. This makes a very good job.

Fig. 7 is another method often adopted. This is simply pieces about 2 in. thick, cut out like a pitch-board, and nailed to step and riser in the *centre* of the staircase. This is plainly shown at B.

Beads, etc.: Method of Bending.—As we have before explained, mouldings of various kinds are usually nailed on the top edge of all wall strings. The method of forming casements to meet the skirtings has been also fully shown. In the present instance, however, a bead is all that we require, which will readily lend itself to our proposed course of action. This will consist of a series of saw *kerfs*, or cuts, run in on the top or bottom of the bead, according to which direction it is wished to bend. This is shown at Fig. 8.

The object of the saw-cuts is to remove a certain portion of the wood, which will be closed up upon bending. Fig. 9 is somewhat exaggerated to show the principle. The subject of bending wood will be more fully explained in a future paper.

Cutting out the Drawings.—A good plan to adopt would be to place an order with your newsagent for *two* numbers of WORK, in which case the drawings could be cut out of one and the text read from the other. This would save a lot of trouble in constantly turning the pages from text to plate, and would well repay the extra outlay.

THE CYCLE: ITS WORTH TO THE NATION.

Being the Third Prize Essay, by "CURRUS" (J. CHARLES KING), *Burchett's Green Cottage, Berks.*

The Name and Notion in the Past.—The term "cycle" comprehends two or three wheeled pedomotors, whatever adventitious sub-designations may be given to them for fancy or trade distinction. Manumotors, of course, are included under the generic term, "cycle."

The evolution of a cycle appears to have been by a series of stages of developments, these developments being dependent, not on the muscular skill to propel a wheeled frame supporting a rider that propelled it, but on materials being discovered suited for the cycle improvements, and methods to make the frame, wheels, and intermotor light enough to serve the purpose of a bearing vehicle for the rider or riders that impelled it. Roadways favourable for easy wheel traction also formed another feature that determined the development of the cycle to its present advanced position as a source of pleasure to so many inhabitants of the United Kingdom, and a trade which is so important that it has been proposed by some persons as an eligible source of future taxation.

In bygone years a cycle was used for foot propulsion on the road, the rider sitting astride a connecting perch, holding a guiding handle as arm-rest.

About seventy years ago one of the Penn family, who was owner of Stoke Park, near Slough, rode a cycle he made from Stoke-Pogis to Southampton and back. It was designated a "Hobby-horse," and where the roads were good, in the vicinity of London, they were commonly in use and let out for hire from wheelwrights' and coachmakers' shops.

In one of the painted windows of a cloister of Stoke-Pogis Church is a beautifully executed design, in a central position amid other stained glass, of a boy angel riding a two-wheeled hobby-horse, blowing a trumpet fixed through the head of the perch he bestrides. The drawing and colouring of the angel are masterly and vivid, but the hobby-horse is vague, and as conventional as so many heraldic devices of implements and machinery are. Certainly far better are the classical and mythological portraiture of war chariots and horse accoutrements; these appendages in some cases are absent, and cloud-whirling ether takes their place. By the sketch it will be seen that a veritable solid framework is shown in this old glass staining, that has been in the present window more than 180 years; but how long before it was done, or who was the clever artist, is a mystery not likely to be solved now. A bullet-hole through the pane of glass above it shows the narrow escape it had from destruction by the stray shot of a deer-shooter in Stoke Park a few years back.

The Velocipede for Road, Rail, and River.—The hobby-horse died a natural death; the work more than the pleasure predominated, and not till the advent of railways did cycling make another start in a velocipede—a safe vehicle on four light wheels mostly, but sometimes on three wheels, the feet working a cranked axle in the hind wheels connected by treadles to swinging rods from the head of the perch. A comfortable high-backed seat was often used, by which considerable lumbar strength was imparted to the foot thrusts.

On railways, hand or foot levers were used, by which the navvies, on a little trolley that held several men, easily worked themselves and tools along the metals. A boat with paddle-wheels worked as a velocipede was to be met with on smooth water. Even horses were experimentally used to carry themselves and their loads, and work a cyclopede by a tread-mill action of an endless flooring, on which they walked and turned gear-wheels actuating road wheels.

The Cycle that came to Stay.—A stanza from a poem on work, will tell that improvements, or the advent of new inventions, were often due to the discovery of materials and their application to simple construction of mechanism.

"And science, too, is circumscribed by chance
Of what materials come to hand, and how.
Without coal, iron, loadstone: what advance
Would man have made? To what do nations bow!"

The light wood cycle on two wheels was a French invention, and worked by an acrobat as a feat for a brief time, till others found how easy it was to do the same thing. This was about thirty years ago. It struck and grew rapidly in England, and as soon as wire wheels were applied, and with rubber tires, it bounded into favour. Tubular ironwork, by which parts were lightened, further promoted its use for long-distance journies; and the almost endless methods of gearing to gain speed and ease the foot motions, or add arm and back power, have each been adapted to the varying powers of the riders.

The pneumatic tires used on invalid carriages nearly fifty years ago, have asserted their value for the healthy athletes whose last long-distance records are 1,000 miles of road travelling in 5 days 11hrs. 35 min., and 341½ miles road travelling in 24 hours.

For spurts on tracks, a quarter of a mile in 31⅕ sec.; half a mile, 1 min. 9¾ sec. on bicycles; and a mile in 2 min. 28⅖ sec. on a tricycle. Such records attest the perfection of mechanism and the stamina of modern Englishmen, and this whirlwind speed seems likely soon to be eclipsed by the lightning's flash to aid the pace and lessen fatigue.

The Commercial Aspects of Cycles.—Cycles would not be made up as stock unless sales were sure. The certainty of disposal warrants large outlay of capital in their manufacture, and, unlike many other things, they seem unaffected by fashion or season to any great extent where they have merit. They are weather-proof, and to use them is deemed sensible and worthy, so that as the youth becomes strong enough he must adventure on a steel steed. The very pace that is necessary to advance takes to new scenes so rapidly, that an impelling attraction to go further and enjoy more of life-motion and mind-views, ever changing, has an almost irresistible charm that seems to make the rider forget the flight of time and the wear of the machine. That they wear out is a proof that they have done good work, and the best made machines get that hard work.

There is no getting a correct census of the cycle trade, as they are made everywhere, from the large Coventry works to the amateur's back

kitchen. The accessory trades have a large added share by repairs and alterations, renewals, and experiments.

The foreign trade cannot be gathered from our costly and viciously faulty Board of Trade returns. It might, perhaps, be dug out of the item, "Hardware," which is put down in these returns by the "ton." The reports of the exports by leading manufacturers would be a reliable statement, and worth annotating annually.

The Moral Aspect of Cycling.—The old song says truly that "He who leads a good life, is sure to live well."

You may make a pun but you cannot pick a pocket while cycling, and you may ride till tired and wobbly, but sobriety is indispensable to cycling. In fact, the machine drills the mind to method, forethought, and order. For a framework of steel and rubber to drill mentally, morally, and physically 50,000 men in a way no general could do, nor any preacher profess to accomplish, is what may be termed in ethics an antinome. That it is done is indisputable; we bow to the fact, and subscribe to the contradiction that mere matter has a temporary, supreme, beneficial sway over mind, and makes a cyclist honest, sober, and virtuous. Another stanza from the same source as the previous one will, perhaps, say all that can be concisely said of this potency:—

"Antinomies that rule in nature show
Or hide profound unfathomable laws
In morals, which from naught, to Heaven grow,
While humble wisdom whispers—"Perhaps?" for cause.
—*The Epic of a Day.*

Back again to the Factory.—It has been deprecatingly said that the modern, improved, up-to-date cycle is the collaboration of a mangle-maker with a bit of old mangle-chain, and an iron bedstead-maker with parts of an old bedstead. Certainly, when broken down, it seems as if made up under these auspices. No doubt the make-up of many cycles is not consonant with economical muscular action of the human frame, or its graceful pose or ease, or for durability of the cycle. If so, the rider is to blame in tolerating that which is harmful, grotesque, and wasteful of means.

As a Trade and Luggage-carrier.—The use of the cycle by tradesmen in cities and towns fairly level, is an important aid to business, and an economy over the horse and cart, with its cost of forage, repairs, stable-rent, and attention. A better form of foot-thrust would be a relief to the hard-working men and boys who carry out orders on the cycle. This is attained partially in some, as the "Monarch." The postmen find it such a boon that they do more work far easier than by walking, so that anything to save wear, and lighten draft, would be a welcome matter for them, whose journeys sometimes reach to 6,000 miles in a year.

For military use its success will lead to machine gunnery from cycles, for which it is so well adapted. The perch may be the barrel of a repeating rifle, the fork-head a rocket-tube. Now a hint in parenthesis. (Please do not rush off to the Patent Office to secure the invention. If you have the craze for patenting, I can make you a present of a score of inventions, so that you can get rid of a lot of money all at once, and save time over the job.)

Of the one-wheeled cycle the riding is immensely clever, but it is out of the range of practical utility except you invert the proceeding, and instead of making your wheel carry you, you make it carry your luggage to the station, and then either boldly or bashfully put your wheel in a hat-box, and slide your bamboo rods together as a fishing-rod, and find you have saved the expense of a luggage porter. There is another embryo patent, but I must stop. I find I have a grumble to let out, so I will wind up with it like a true Briton.

The Cycle of the Future, and a Grumble.—They are too dear for a working man, who has to wait till he can afford to buy a second-hand one, often patched, etc., and with a lot of out-of-date parts. If one firm can make 26 in. wheel cycles for £6, and tricycles for £6 15s., and give money's worth in late improvements, why cannot other larger firms? Another firm offers cycles for £7 10s. These prices approach a workman's means, and the workwoman's also, so that a moderate price would augment the trade with those who would wear them out in usefully going to and returning from work. A cavalcade of men and women cyclists on their journies to and from their healthy suburban homes would be a gratifying sight, and spare many a Londoner the repulsive sights of soddened misery lounging round public-house doors, or wallowing in slum filth.

It would not be in human nature for a cyclist who has ridden up roads rising 1 ft. in 6, and down them, to write about cycles, and think perfection is obtained with—(1) a chain with its drag and back-lash; (2) a pedalling with a getting-upstairs motion, though going on the level; (3) a seat that is a sorry crutch, without aid to the weary back, or from the strong back to aid the weary legs; (4) with arms that are needlessly idle, when they might save the legs, and by their reciprocal and natural action promote health; (5) and with wheels that have a quick-wearing, rolly-pudding on the rims to be devoured by the road, when proper rims would guard this fragile puff-pad, save draft, health, and pocket; (6) or when spinning on a smooth road to have to keep moving the legs instead of resting them on the pedals; (7) or have to impel along a safety bicycle weighing 40 lb. when they can be made to weigh only 22 lb., or a tricycle weighing 60 lb. when they can be made to weigh only 30 lb. Thirty-six pounds was the weight of a tricycle used by the writer thirty years ago, when roads were not so good as now.

I have formulated these seven grumbles. These are seven weak points of the cycle, which must be made the strong points. They may not emanate from the factory with its large stock of parts to be used up, but more likely from the isolated worker who plods at the forge thoughtfully long after his neighbours have gone to dreamy repose. He is the man who will improve the cycle, as it much needs improving, be it two or three-wheeled. Then the trade will improve, and the workers will have less hesitancy of taking a cottage a little way out from the turmoil of the town, and his or her health and joys of life will be increased and maintained, and practically demonstrate the Cycle's worth to the Nation.

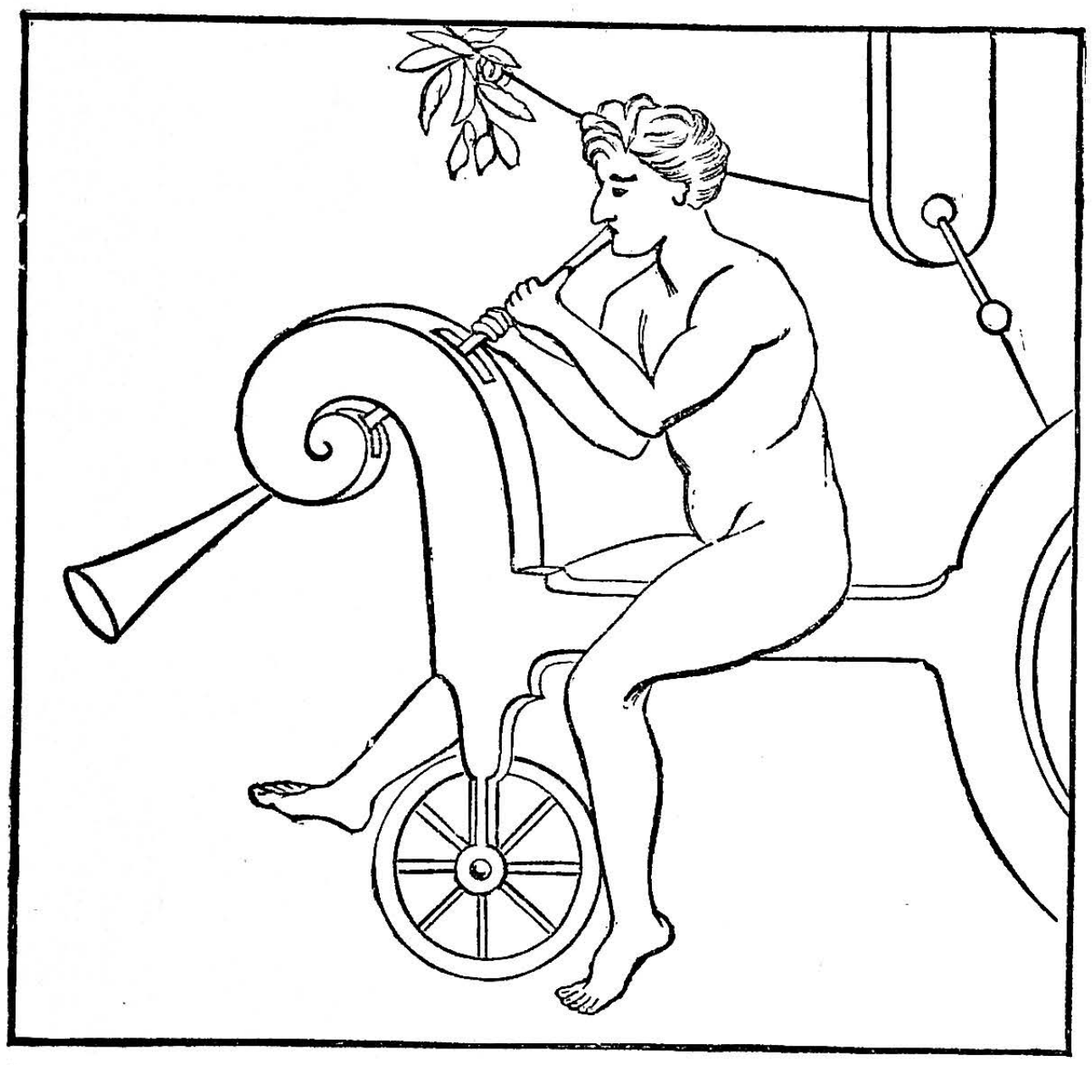


Diagram copied from Stained Window in Stoke-Pogis Church, Bucks.

NOTES FOR WORKERS.

THE first telegraph line in the United States was from Washington to Baltimore, a distance of forty miles, and was opened on May 17th, 1840, by Professor Morse. In 1890 there were 800,000 miles of wire, over 24,000 offices in use, and nearly 67,000,000 telegrams were sent.

IN Norway and Sweden habitual drunkards are imprisoned, and during incarceration they are fed on bread and wine, no water being allowed them. The bread is steeped in wine for an hour before being given to the prisoner, who, although liking it at first, after eight or ten days is so nauseated by it that he refuses it.

IF the finger-nails be kept well trimmed and polished, there is not the same danger of poisonous matter adhering to them as when untrimmed and dirty.

ALL the commissions that have visited Peru during the last two years agree that the country is suitable for European immigration on a large scale. Peru wants both skilled labour and agricultural labourers.

THE sewing-machine is the only machinery used in Sierra Leone. The colony is 103 years old, and has a population of 50,000, without a saw mill or any other sort of mill to do any kind of woodwork.

BOOKS.

Handicraft.—"The Manual of the Guild and School of Handicraft." C. R. Ashbee, M.A. (Cassell & Company, Limited.)—At the present time, when the subject of technical education is demanding the attention of all thoughtful minds, the issue of such a manual as this is particularly welcome. Its purpose is to serve as a guide to those who, in connection with the various County Councils, schools, and institutions, are seeking to establish on a firmer footing what has hitherto been neglected—the intermediate and technical education of the country. It is also to serve as a guide to the instructor and elementary teacher in technical work. Mr. Ashbee has done such good work for technical education in connection with the Guild and School of Handicraft at Mile End, E., that we can recognise the value of what he says or writes upon the subject he has at heart. The future of British trades and crafts is a matter of great moment. Much information relating to the technical education movement is contained in this manual, and everyone concerned ought to read it.

Pigeons.—"Pigeons: their Origin, Variation, etc." Rev. W. F. Lumley, A.K.C. ("Feather World" Office.) This may be briefly characterised as a handy little book for pigeon fanciers, which will put them in possession of pretty well all they want to know and ought to know about their particular pets. It is one of the "Feathered World Guide Books," known collectively as the "Simplex Series," and its full title runs thus—"Pigeons: their Origin and Variation, their Housing and Management, accompanied by Practical Illustrations." It is divided into two parts, whereof Part I. deals with the pigeon house in different forms and appliances suitable for it; the parasites that are found in the nests; and all about the choice, purchase, mating, pairing, nesting, hatching, and feeding of pigeons, with remarks on judging and classification. Part II. contains twenty-two chapters devoted to the consideration and description of different fancy pigeons and their varieties. These fancy birds are illustrated sufficiently well to exhibit their various characteristics as noted in the descriptions. The engravings of the pigeon houses, etc., are useful, but they are not marked by any novelty of form or artistic conception, such as an amateur would look for who was willing and able to house his birds in structures that were somewhat out of the current run.

TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

TIMBER TRADE.—A good demand for mining timber and pit props continues.

CHEMICAL TRADE.—Trade is very firm, higher prices prevailing. Bleaching powder is very scarce. More inquiries for caustic soda. In sulphur the changes are slight. South Durham salt is quiet.

COAL TRADE.—The Newcastle coal trade for best steam is firm; for gas coals the demand is beginning to increase; bunker coals are dull; manufacturing coals quiet. Coke is steady, with an increasing demand for northern furnaces.

IRON TRADE.—At Middlesbro' the finished iron manufacturers report a dearth of fresh orders, and the condition of the shipping and shipbuilding industries does not speak favourably for the future. Business in the Lancashire iron trade continues slow, but prices continue firm. In the manufactured iron trade no improvement is reported, the prices taken only just covering cost of production. In the Staffordshire pig-iron trade, large sales have been effected recently, and iron founders have been placing orders up to Christmas, many of the leading makers having now their full make contracted for up to that date.

TINPLATE TRADE.—The condition of trade in the Swansea district is becoming very serious. About 12,000 workmen in South Wales are already out of employ, many large works being closed. The proprietors of the Worcester and Upper Forest tinplate and steel works at Morriston have intimated their intention to close the works. 2,000 hands will be affected.

STEEL TRADE.—Small business is being done in the Lancashire steel trade. Steel boiler plates have been bought at £7 5s. per ton; steel angles have fallen considerably; and in small girders, both English and foreign makers have lately been quoting 15s. per ton under recent prices in order to secure business.

COTTON TRADE.—The Oldham spinners have decided to give notice of a 5 per cent. reduction of wages if 80 per cent. of the employers are found to be in favour of the proposal. Bad reports as to the condition of the industry continue to be received, especially from North Lancashire. At Preston a proposal is on foot to work three days a week and reduce wages 10 per cent. until trade improves.

ENGINEERING TRADE.—Many of the leading firms of machine tool makers continue fairly busy, as also do the makers of large stationary engines. Machinists are experiencing the effects of the depression in the cotton trade, and have little work on hand, with a bad outlook. Locomotive builders are keenly competing for the few orders that are coming forward. Boiler makers are busy, and have good prospects, but the prices rule low. A Tyne engineering firm are required to build twin triple-expansion engines for a large Russian battle-ship, also boilers for the same. They have also on hand three sets of triple-expansion engines for torpedo gunboats, as well as their boilers, for the British Government. Trade on the river generally may be considered as only fair.

SHIPBUILDING TRADE.—No change has taken place in the condition of the Mersey shipbuilding trade, but at Barrow, although new orders are not easily obtained, there is a fair amount of work on hand. A difficulty with the workmen is expected, however, as a 5 per cent. reduction of wages is demanded by the masters, and a strike appears inevitable. Messrs. Railton, Dixon & Co., shipbuilders, of Stockton-on-Tees, will close their No. 2 shipyard through scarcity of orders. We understand that if a million of money is expended, as is proposed, in Bristol for dock improvements for the mail and passenger trade between that port and America, Liverpool companies have intimated, or promised, to give a share of patronage. The principal advantages offered by the Bristol authorities are: (1) That there will be a saving in cost of coal to the extent of from 4s. to 6s. per ton; (2) a saving of from four to five hours as between New York and London, also a slight saving as to Liverpool; (3) that Bristol is more centrally situated as regards the distribution of traffic.

PAINT TRADE.—Colours are quoted as follows: Ochres: Oxfordshire, common, £10, medium, £12, best, £15; Derbyshire, 40s. to 60s.; Welsh, common, 18s., best, 70s. Umber: Turkish, quiet; Devonshire, 50s. to 55s. Venetian red, £6 10s. to £10. Cobalt, prepared oxide, 10s. 6d.; black, 9s. 9d.; blue, 6s. 6d. Zaffres: No. 1, 3s. 6d.; No. 2, 2s. 6d. Oxide of iron: common, £6; medium, £10; finest, £20.

SILVER TRADE.—This is gradually improving in Sheffield. Britannia metal departments are quiet.

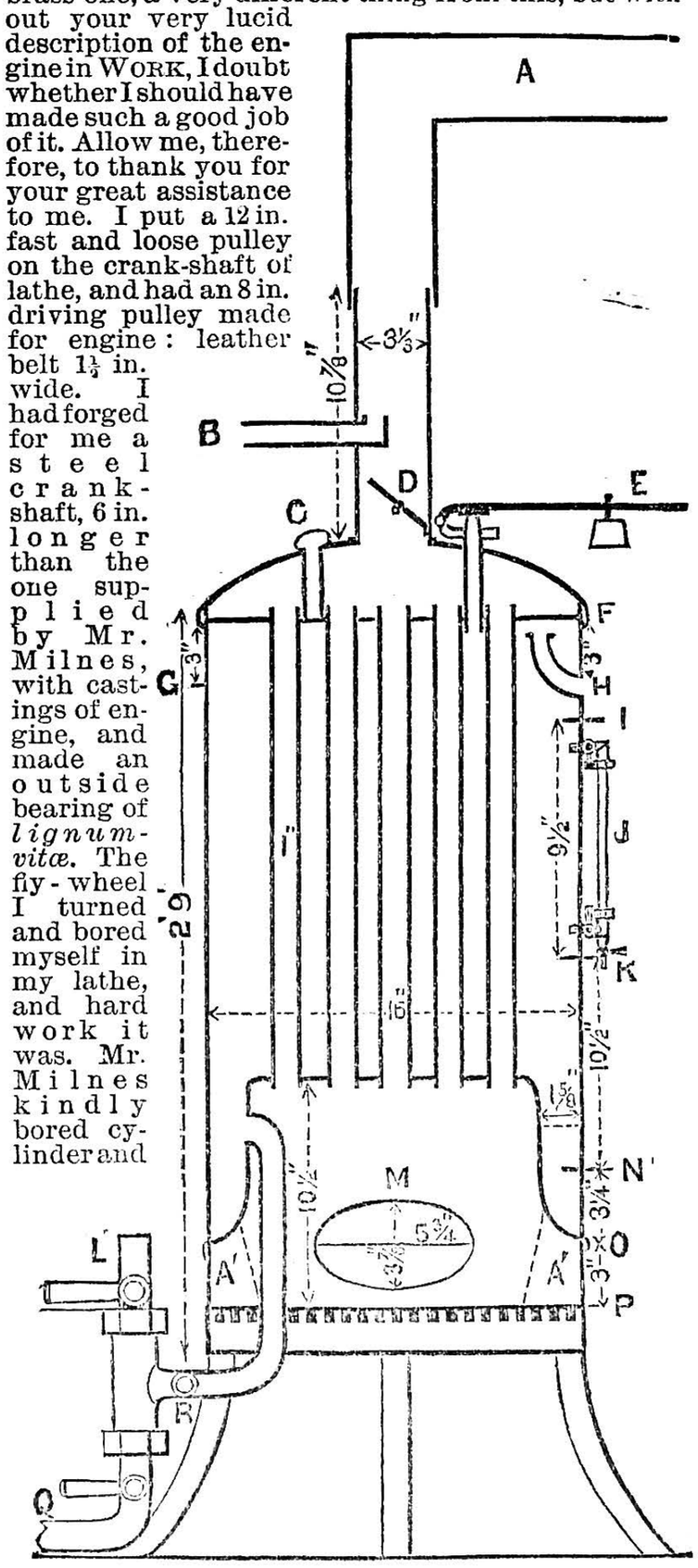
WOOLLEN TRADE.—An old firm in Bradford have resolved to close their Yorkshire factories, where they employed 1,200 hands and turned over £200,000 per annum, and transfer their business to Jamestown, U.S.A., where their factories are now being built. Arrangements are being made for the workpeople to accompany the firm to the States.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTER FROM A CORRESPONDENT.

Quarter Horse-Power Steam Engine.—"S." writes:—"You may be interested in hearing that, having finished the ¼ h.-p. engine as described by you in WORK, I made a trial run recently, which was, I think, most successful. The engine took a deep cut off a bar of 2 in. iron, working at only 25 lb. pressure. My lathe is one of Milnes', of Bradford, 5 in. screw-cutting. I think I may be fairly proud of my work, seeing this is only my second attempt at engine-making; my first was a small brass one, a very different thing from this, but without your very lucid description of the engine in WORK, I doubt whether I should have made such a good job of it. Allow me, therefore, to thank you for your great assistance to me. I put a 12 in. fast and loose pulley on the crank-shaft of lathe, and had an 8 in. driving pulley made for engine: leather belt 1½ in. wide. I had forged for me a steel crank-shaft, 6 in. longer than the one supplied by Mr. Milnes, with castings of engine, and made an outside bearing of *lignum-vitæ*. The fly-wheel I turned and bored myself in my lathe, and hard work it was. Mr. Milnes kindly bored cylinder and planed bed; the rest of the engine is all my work. I had some difficulty with arms of governor, as there was no casting nor forging for same. I made them by screwing on small levers at an angle of 120°, but I am not very pleased with the appearance—it doesn't look quite workmanlike. I think I shall either make a pattern and have them cast in gun-metal, or get someone to forge them for me. If I might make a suggestion, it would be better not to have the top cover of cylinder with hole for piston-rod cored out: I found in turning up cover that the hole wouldn't true up to ⅝ in., so had to make my piston-rod a shade larger; and same with the gland. I had to get another gland cast for me solid, as the hole cored out wouldn't true up to size. Also steam-chest—the casting was in the rough a shade over 1½ in. across, so I had to just take off a very little from both slide-valve and steam-chest to get them square; you might also, in slide-valve, allow a little more for squaring up hole inside, for, even leaving part of rough casting, I made it a full 1⅛ in. I must say that the castings were wonderfully good and very cheap. I should be obliged if you would give me some advice *re* boiler. I have had made a copper boiler ⅛ in. thick all over and riveted, twenty-one 1 in. tubes for flues, water space diameter 16 in., height 30 in., very good draught. This burns a lot of charcoal; would coke or coal do instead? I am told that the sulphur is very bad for copper boilers; is that so? If it is, as the boiler is an expensive affair, I don't want to spoil it in saving cost of fuel. As to feed water, I softened the water with lime and caustic soda, but don't know the right proportions. Could you tell me the proper quantities to put for the East London water? I think at present there is an excess of caustic soda; that would not hurt the boiler, I suppose? Even at the best some scale is sure to form, and yet there is no means of getting at the inside. How would it do to nearly empty the boiler occasionally, and throw in some diluted hydrochloric acid to dissolve the scale and then wash out? I believe hydrochloric acid has very little action on copper."—In reply to a request for a sketch of the boiler, "S." sends the one accompanying this, and writes again as follows:—"I have one of Fletcher's burners for lighting fire, to put underneath, and then remove when fire is well alight. Gas supply, ⅜ in. iron. From top of funnel I put stove-pipes to ventilator into chimney, and closed fireplace, and packed around stove-pipe with asbestos where it enters chimney, so get a very fair draught. Passed exhaust into funnel. Instead of turning up end of tube, I plugged it and filed hole in top of pipe. For water supply I have injector, and the water passes through furnace before entering boiler. I intend to make pump as well. Injector did not act first time, but was all right when I ran engine again. There was probably some white-lead in the injector the first time. There are no hand-holes, only holes for fittings. One might examine interior with a taper through them, but that is all. The boiler was tested to 195 lb. per square inch by hydraulic pressure. I used wood as fuel; it made steam very quickly, but of course coke or coal would be more convenient. Governor I made with lever to regulate with weights. I don't see why one could not get ¾ h.-p. out of this engine, or even more, if you ran it fast enough; it is merely a matter of enough steam and pressure. I should have had a larger boiler, but workshop being at the top of house the weight of an iron one would not have done. Later on I shall make a dynamo, and thought of making one described by Croft—120 candle-power. Do you think my boiler would supply enough steam to do that? If not, I might make a 50 candle dynamo instead, merely to light up workshop. I put on blow-off cocks for cylinder, and think of putting oil-cup for cylinder on top of steam-chest, as there is room." I do not consider myself an authority on small boilers, and I have therefore submitted the above letters to two practical men. The first points out the unusual position of the fire-bars—3 in. below the water—which he thinks "would cause a loss of heat." This is evidently done to simplify the fire-hole, and it will give a large fire-grate, useful for burning wood. In my opinion the objection to this plan is that the sediment may fall into and accumulate in this lower part just over or in the fire, instead of, as usual, below it, and thus the plate may become overheated. I think there should be at least one hand-hole to admit of inspection of this part, and the blow-off cock should be opened before starting work, so as to drive out any sediment that may have settled. If coal is burnt it might be well to line the lower part of the fire-box with fire-clay, where the dotted lines A', A', are seen, which I have added to the sketch, and this would both prevent the loss of some heat, concentrate the heat of the fire, and protect the lowest part of the boiler. The method of introducing the feed-water seems to me objectionable, interfering unnecessarily with the removal of the fire-bars. It is usual to introduce the feed-water at about the water-line, because then if any of the valves—retention or pump-valves—leak, so that the boiler loses water, it cannot run down very far. My friend writes further:—Copper is by far the best material for small boilers, but workmanship becomes the most important factor for strength. Hydraulic testing is the safer, but this should not be pushed too far; for a boiler intended to work at 60 lb., 100 lb., or 110 lb. is ample. Boilers may be weakened and almost ruptured by excess in testing. Your friend's exhaust would be better had he formed it as a taper and round elbow, which he could easily have inserted. The expanding steam should form a central jet, which acts as a piston to expel the air, and the more accurately this is in the centre the better. Fuel in a small boiler is a difficulty. I fear anthracite coal will be found unmanageable unless broken into small pieces, freed from dust, and a small portion of charcoal used with it; this would give a stronger and cheaper fire than all charcoal. All caking coal must be avoided; the lighter varieties that burn to a white ash might do. If your friend must use hard water, I should recommend the original Clark's process, without the soda, as a caustic alkali in a small boiler is sure to be carried by the steam as priming into slide and



Quarter Horse-Power Steam Engine—A, to Chimney; B, Steam Exhaust; C, Man-hole; D, Damper; E, Safety-valve; F, Rivets; G, Pressure Gauge and Injector; H, Steam Supply; I, Tap Steam; J, Water Gauge; K, Tap Water; L, for Pump when made; M, Fire-door; N, Tap Water; O, Rivets; P, Top of Fire-bars; Q, Water Supply from Injector; R, Back Pressure Valve.

cylinder, converting the oil or tallow into a soluble soap. Make some lime-water from good quicklime, and stir in about two fluid ounces to a gallon of water, leaving it ten hours to settle, and use the upper clear portion. But why not use rain-water? A 100 gallon galvanised cistern would store all that so small a boiler would require, and an occasional dose of a little hard water to form a slight deposit would add to the durability of the boiler. I now come to the reply given by my second adviser. He says:—"Sulphur in fuel is injurious to boilers, but would not tell much on a small boiler, which is probably not used very much. Coke is the worst; house coal is better, but is likely to cause too much soot (especially in the case of 1 in. tubes); anthracite coal is the best fuel to use provided there is enough draught. This boiler would not burst at 250 lb. if the seams and rivets are sound; it might bulge if this pressure is exceeded; I consider 50 lb. to 60 lb. working pressure quite safe. A very little soda now and then, or any of the compositions sold for that purpose, will keep the boiler free from incrustation. Also to vary the level of the water daily, when not in use, is of importance. The boiler is capable of working a good dynamo of 120 candle-power, but the attention and stoking may be troublesome to raise enough steam in so small a boiler. I can find no fault with the construction and fitting up in general but the steam supply to engine, if carried upward through top of boiler instead of downwards." I think "S." will find here most of the information he seeks, and that what he and we have written will be useful to others who have undertaken to make the ¼ h.-p. engine. I am very glad "S." has succeeded so well, and that he found the description clear and the castings good. With regard to what he says about some of the holes coming out too large, that would arise if they were not exactly in the centre of the castings; and if the casting was held in a universal chuck, so that the outside ran true, it might have been remedied by putting a bit of tin under one of the jaws of the universal, so as to bring the hole more nearly true, and throw out the rim a little. On the whole, perhaps, it would be better to cut off the prints from these little things, and cast them solid. The plan of having a longer crank-shaft which "S." has adopted is a very good one. Very likely the *lignum-vitæ* bearing will last well, but it would look better to have another bearing, similar to the other two, and there should be made a strong wooden frame, properly bolted together, to keep the third bearing firmly fixed at the correct distance, and in exact alignment with the other two. It was intended that the arms of the governor should be made of forgings, but Mr. Milnes now has a pattern, and sends out the arms cast in gun-metal. The general appearance of the boiler gives me the impression that the fire-box is too low, and that the fire-door should be higher up, so as to admit of a greater depth of fire, and more room for combustion before the gases enter the tubes; still, no doubt the boiler is a good one, and will serve you well. With regard to the strength I reckon it thus:—The plate of the shell being ⅛ in. thick, a 4 in. length of the shell being cut through diametrically will expose a section on each side of ⅛ in × 4 in. = ½ in., or on both sides taken together of 1 sq. in. Now, one square inch of sheet copper has a tenacity of 33,000 lb., and if riveted with a single row of rivets its strength will be reduced to a little over half this—say, 17,000 lb., or, to be on the safe side, 16,000 lb. Now, since the diameter of the shell is 16 in., and the length of the piece of shell we are considering 4 in., and $16 \times 4 = 64$, the pressure of steam tending to burst the ring or section of shell having a sectional area of 1 sq. in. acts on an area of 64 sq. in., and $\frac{16000}{64} = 250$, the lowest bursting pressure. The furnace is smaller in diameter, and it is also so short that it derives strength from each end; if it were longer, or rather taller, it would require to be rather thicker, since the tensile strength of copper is more than double its crushing strength. In conclusion, I beg to congratulate "S." on his success, and to say that if he will write again by-and-bye and tell us how he gets on, it will probably interest and encourage others who are following him.—F. A. M.

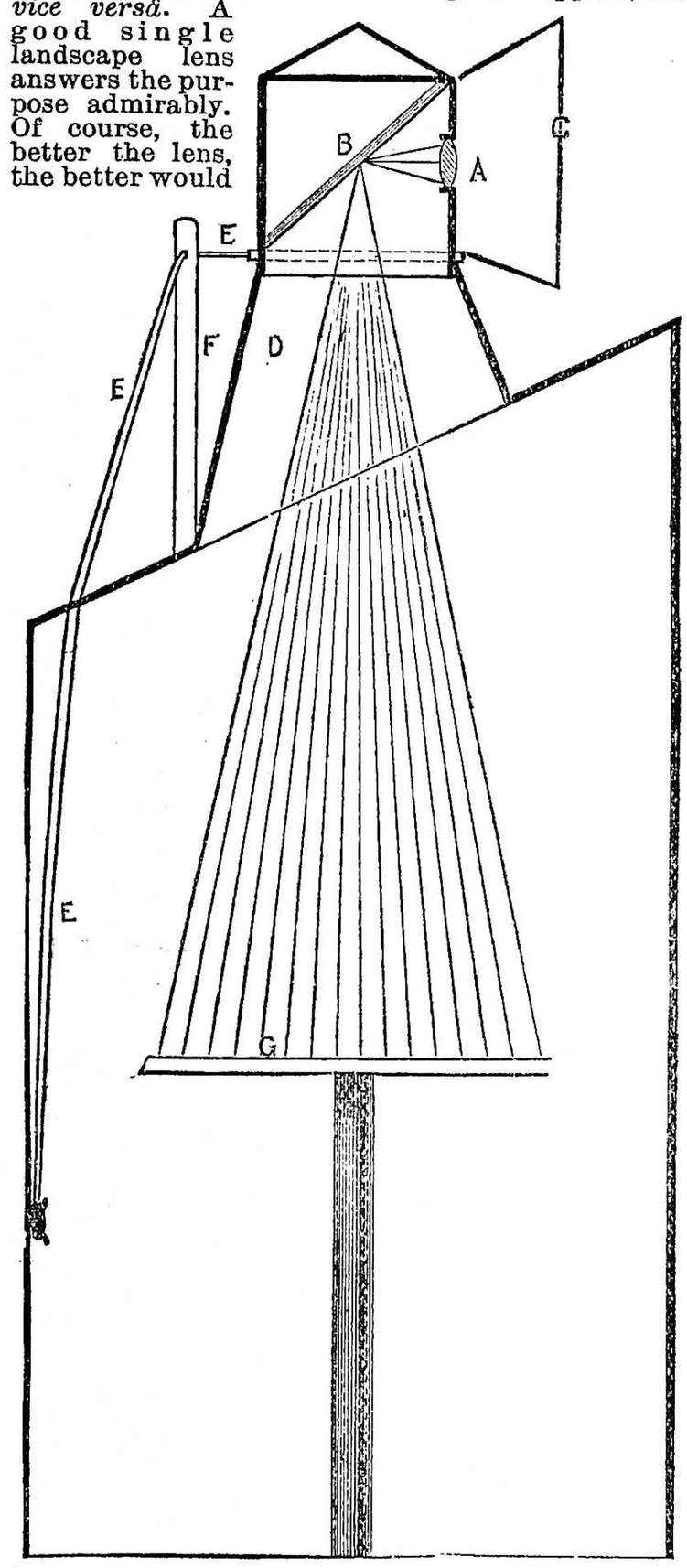
II.—Questions Answered by Editor and Staff.

Patent.—Poor Man.—If our correspondent will refer to our article on Patents (No. 44, Vol. I., p. 694), and also to our article in No. 175, Vol. IV., p. 296, and read and *carefully* study them, he will no doubt be able to see how far it would be to his interest and advantage to follow the course proposed. If he will take our advice, he will carefully avoid anything of the kind mentioned, as he would infallibly meet with great trouble and disappointment, and most probably end by losing it altogether. Such affairs are carried on on the principle of "heads, I win—tails, you lose," and you are not placed on an equal footing in the matter. It would not pay to do that; the risk to them would be too great.—C. E.

Oil Colours.—A Reader.—The question you ask could be as easily answered at any large stationer's shop, where oil colours can usually be bought in collapsible tubes. With respect to their being sold "in boxes like water colours," Rowney & Co. sell admirable little sets for painting in oil. These are contained in japanned tin boxes, and are furnished with colours, brushes, and palettes. Brodie & Middleton are a good firm for such requisites. If you buy locally, see that you get the goods of a reliable firm, such as Rowney, Reeves, Barnard, or Winsor & Newton.—Decorator.

Dry Battery.—J. H. (*No Address*).—You may utilise your 6 in. × 3¾ in. stoneware jars as outer cells for a dry battery. Place zinc cylinders in these, put an ordinary carbon block in the centre, and pack the space between carbon and zinc with a mixture of equal parts of zinc white and plaster-of-Paris, made moist with a little killed spirits. Cover the filled cell with a seal of pitch.—G. E. B.

Camera Obscura.—Camera.—In arranging a camera obscura, the first condition is that it shall be elevated above the surroundings, so that the lens may have an unobstructed view. The next is to construct a small box in which the lens can be fixed, and which can be revolved by means of a cord from the inside. The light, passing through the lens, is reflected from a mirror placed at an angle of 45 deg. to the lens (inside the revolving box), on to a table placed beneath. A lens of about 20 in. focus is suitable; the longer the focus of the lens, the larger the reflected image will appear, and *vice versâ*. A good single landscape lens answers the purpose admirably. Of course, the better the lens, the better would be the definition of the image. It is important that the surface of the table on which the image is thrown is a perfectly dead white. This is attained by coating the table with plaster-of-Paris, and then scraping and sand-papering it perfectly level; another advantage of this surface is that if it gets soiled, a rub with sand-paper will set it right again. The height of the table must be suited to the image thrown by the lens, and ascertained by experiment. When the image is sharply defined, the height is correct. The accompanying diagram will show how the camera is generally managed. The lens is better protected by a hood, which improves the brightness of the image and also protects the lens from the raindrops that, falling on the glass, would cause indistinctness of the picture. A cover is generally made to protect the lens when not in use. In the diagram sent it would be as well to make a turret for the lens, so that it would overlook the highest part of the roof.—D.



Camera Obscura. A, Lens; B, Mirror; C, Hood; D, Turret; E, E, E, Cords; F, Upright Guide for Cords; G, Table.

Makers of Electrical Apparatus.—W. R. M. (*Sowerby Bridge*).—Either of the following make and sell model dynamos and other electrical apparatus: Mr. G. Bowron, Praed Street, London, W.; Mr. S. Bottone, Wallington, Surrey; Mr. T. Bonney, Avenue Road, Lewisham, S.E.; Mr. A. Crofts, Dover, Kent; or consult the advertisement columns of Work.—G. E. B.

Glass.—C. S. (*Derby*).—It would be impossible for the writers of the various articles that appear in Work to give all the names of the firms where everything could be purchased that is required to make the piece of work described, because they would naturally be more conversant with those firms located in or about the part they lived, and whose addresses would most likely be farthest away from the person requiring the goods. For instance, let us suppose I am writing an article for this paper in Manchester, I should give the names, etc., of those firms I knew of in Manchester, who could supply the necessary goods required. Now, you reside in London, and wish to make the article; what good would the names of the firms I should have given be to you? And I need hardly say that it would be most impracticable to give the names of firms in every town in the United Kingdom that supply the things in question, even if it were possible. That is partly the object of "Shop"—viz., to answer individual questions relating to the articles appearing in the other part of the paper. I think I might venture to say that if you looked through a Derby directory you would be almost sure to see the name of some firm who would supply you with bevelled glass. If you cannot see one, you could obtain it from Stevens, Charles Street, Hatton Garden, London, E.C.—E. D.

Knotting.—Accrington.—"Knotting," or as it is usually written, *Patent Knotting*, is a quick-drying, semi-transparent fluid. It is made from naphtha and shellac, hence its quick-drying nature. The knots of woodwork, especially pine, contain much resin, which gradually exudes from the surface. This resin will speedily darken and ultimately destroy the covering film of oil paint with which woodwork is usually coated. The object of coating knots in woodwork with "patent knotting composition" is to seal up, so to term it, the resin. In the earlier history of house-painting processes a mixture of red lead and strong glue size, applied warm, was often used. The chief point in view is to stop the "cause," but without objectionable "effect," therefore the thinnest perceptible covering—so long as it is effectual—is the best. The *Patent Knotting* of commerce is the article now generally purchased and used. The knots are given one or two *bare* coatings—according to the nature of the knot and the conscience of the workman. The best knotting is the colour of dark oak varnish, the worst is the blackest and dirtiest-looking. It always pays to have the best knotting, since "black knotting" requires an extra coat of paint to cover the dark patches which "grin through" any light tints. For the best work it is usually advisable—especially when the woodwork has to be finished and perhaps hand-polished in "ivory white" enamel—to have the knots cut out with a chisel or gouge, then fill up with lead "filling-up" in distemper. I recently had to have the door of an elaborately decorated drawing-room so treated, since, despite being fresh knotted, the resin began to discolour the work, which had received some six coats of paint and enamel, ere the room was furnished—a very annoying and costly matter. Very occasionally knots are gilded over with best gold leaf; this is generally conceded to be an effectual plan to adopt, when gouging is not resorted to, for finest work. Knotting woodwork is, therefore, not an insignificant detail of house painting, especially when we are dealing with a door-side; that alone, when finished in hand-polished enamel, may cost a ten-pound note to produce. "Tin paint" will do for common priming; good linseed oil is the chief element required. All new woodwork requires three coats good lead and oil paint before standing any time—viz., priming, and two after coats. This is known as "builders' finish." When permanently decorated it usually requires "getting up" to a proper surface, and two or three more coats.—Decorator.

Electric Light Cable.—T. A. (*Hammersmith*).—The size of cable for the main of an electric light installation to supply 100 8 c.-p. lamps at a pressure of 110 volts, should be 19-strand No. 18 copper wire rope, well insulated. This will safely carry a current of 35 ampères. A 7-strand No. 16 copper wire cable will only carry 23 ampères, and this will not be enough for your installation. From your letter, I suppose you are having a transformed current. If that is so, the fault may be in the transformer, or it may be in the meter, or it may be that the main switch offers too much resistance. Have you means at hand for testing the temperature of any of the connections at the meter, or at the main switch when the full load is on? If any of these get hot, the fault is in the hot connection, and this must be made larger. If the cable is large enough and the connections all right, have the transformer seen to, for the fault is likely to be there.—G. E. B.

Model Dynamo.—T. W. (*Harpurhey*) and E. W. (*Strand*).—If you wish to make a model dynamo capable of doing useful work, get Nos. 92, 94, and 99, Vol. II., of Work, and select one of the machines described and illustrated in those numbers. If you only desire a pretty little model for show purposes alone, get No. 108, and make the model electro-motor described and illustrated therein. This motor is a model of a dynamo, and will serve to show what a dynamo is like.—G. E. B.

Dry Battery.—Richmond.—I am doubtful whether any person outside the manufactory and the inventor's own sanctum can tell you the "exact composition of the excitant and of the depolariser in Dr. Gassner's dry battery." What end can be attained by knowing the exact details of a patented

invention? I believe the paste to be a compound of zinc oxide, lime sulphate, zinc chloride, and ammonium chloride, but do not know the exact proportions.—G. E. B.

Book on Prices.—A. E. H. (*Lowick*).—I do not think any book has been published dealing with house painting and decorating prices alone. As a branch of the building trades, you will find certain average values of labour and material in any of the established builders' price books. The price of labour and craftsmanship differs very materially in various home districts, hence the impossibility of publishing a scale of charges for the trade generally. In house painting especially, the amount of time required to prepare old work for repainting may differ with a dozen rooms, otherwise exactly similar. Woodwork in a sunny room gets badly blistered; a north room may be in good condition, and cost but half the former to make a good job of. Again, the style and finish is a very important factor. The best and safest standard for pricing the ordinary work of a provincial town or village is practical experience, a personal knowledge of how long a piece of work will take in execution, and how much material will be used. Respecting "general information," subscribe to and read diligently the special literature of the art and craft, and much that has appeared in the back numbers of WORK.—DECORATOR.

Circular Saw.—SUBSCRIBER.—Your belt will continue to slip while you drive your saw with a 12 in. pulley, the diameter not being great enough to drive a 48 in. circular saw. If your saw is principally for cutting soft wood, the pulley should not be less than 16 in. diameter; 18 in. would be still better. Also, if its chief work is to cut hard wood, the pulley should be 20 in. or 22 in. diameter. Several reasons may be given why a belt slips when driving a circular saw. The teeth may be improperly sharpened for the kind of work they have to do; a belt may be too narrow or too short. I might say here that a belt to drive your saw should not be less than 7 in. or 8 in. wide when running over pulleys of the diameter above given, and the distance between centres about 20 ft. The speed and feed, too, are matters of importance. To deal fully with these points would take up too much space in "Shop." You should get a larger pulley on your saw-spindle, and a belt the width mentioned above; then if you have further trouble, write again, stating the speed at which your saw is driven, and the rate the timber is fed to the saw. In reference to allowing for stretch when putting on a new leather belt, the belt should be passed around the pulleys and pulled tight, and the length measured from the end to where it butts. Then allow 1 in. for every 5 ft. of its length. For instance, if a belt measures 60 ft. in length, 12 in. should be allowed for stretch. Again, when the belt has been working a while, and becomes slack so that it slips, take it up 1 in. to every 10 ft., and, when it requires taking up again, 1 in. to 20 ft. If the leather is of inferior quality, it will require to be taken up more than stated above, and the belt will give a deal of trouble. There are so-called cheap belts sold which are dear in the long run. Now, if you wish to test the quality of a new belt, the following has been recommended. Cut a piece of the leather off and put it into strong vinegar. If the leather has been thoroughly tanned, and is of good quality, it will remain for months in the vinegar without alteration, merely becoming a little darker in colour. But if not well impregnated by the tannin, the fibres will swell, and after a short period become transformed into pulp.—A. R.

Workshop Alarum.—J. H. B. (*Liskeard*).—As you are a clockmaker, and know "Gent's Watchman's Clock," you can easily adapt any clock to your purpose, taking that clock as your model. Arrange a train of wheels to revolve a small horizontal table once in twenty-four hours. Attach a circular piece of clean paper, or a disc of cardboard, to the centre of the table, and divide the paper into sections, each representing an hour. These may be subdivided into parts of hours. A metal arm, carrying at one end a pencil-holder, and at the other a soft iron armature, must be pivoted in such a position as to allow a pencil to touch the revolving disc of paper when the armature is attracted to an electro-magnet fixed above the armature. The electro-magnet and armature should be similar to those employed in small electric bells. The sections of the revolving disc must be numbered to correspond with the figures on the clock dial, and the two sets must synchronise at all times. A Leclanché battery of three medium cells may be used, and an ordinary door trigger placed inside the door to close the circuit when the door is opened. This should be made to work stiffly. When the door is opened, the circuit will be closed by the trigger, the electro-magnet will pull up the armature, and cause the point of the pencil to touch the disc, leaving its mark there at the exact hour, and, at the same time, ring a bell.—G. E. B.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Yacht Hull.—F. A. D. (*London, S.W.*) writes:—"Will any reader of WORK kindly give me full particulars for making the boarded hull of a 5 ft. model yacht?"

Enamel.—COLNEITE writes:—"Would some reader of WORK give a recipe for a good enamel, white or red—one not too complicated?"

Fuller's Bichromate Battery.—H. C. G. (*Islington*) writes:—"Would some reader of WORK inform me what are the quantities of chemicals used in Fuller's bichromate battery—quart size, method of making up, and size of porous cell?"

Monograms.—J. H. B. (*Glasgow*) writes:—"Will any kind reader be good enough to give me designs for monograms of 'J. H. B.' and 'M. B. B.'?"

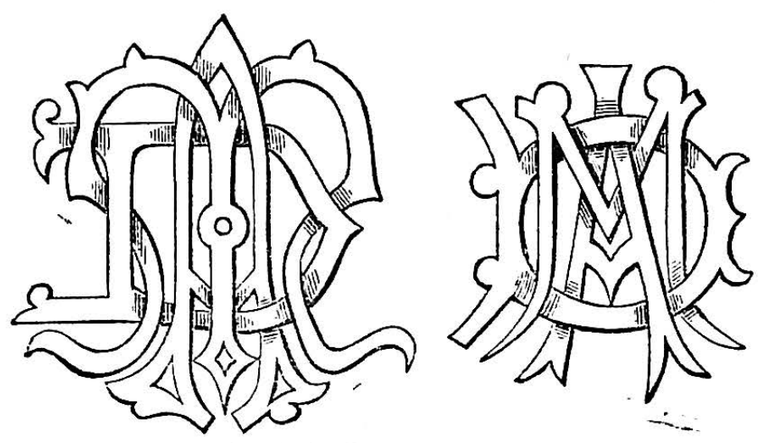
Albumen.—LEARNER writes:—"(1) From what material can a good cheap albumen be obtained? (2) By what process? (3) How can it be sterilised?"

Mail Cart.—TINKER (*Reading*) writes:—"Will S. P. (*Plymouth*) kindly give a little fuller description of the mail cart shown in No. 174, page 284? I am thinking of making one for my little girl, and I like S. P.'s design, but cannot quite understand the material the body-frame is made from. A few dimensions would also assist."

Oval.—OVAL writes:—"Will any of our kind readers inform me how to draw an oval to any given length or width? A few diagrams would greatly oblige."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

"A. M. D." Monogram.—R. D. T. (*Marylebone*) writes:—"I send to C. H. D. (*Shepherd's Bush*) (see



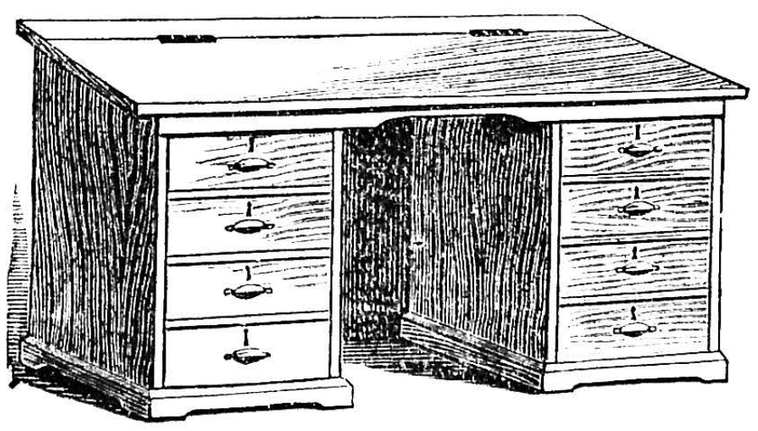
"A. M. D." Monograms.

No. 174, page 286), who asks for an easy monogram, 'A. M. D.,' for fretwork, two designs, one of which I trust will help our correspondent."

Frame-Making.—J. ANDERTON (475, *Bolton Road, Smallheath, Birmingham*) writes in reply to query by J. T. M., who asks for his address.

Asphalte Paths.—A. B. (*Salford*) writes, in reply to W. R. (*St. Albans*) (see No. 176):—"The best plan would be to get this done by some local contractor. If W. R. wants to do them himself, let him proceed as follows:—Excavate the soil to a depth of 3 in. below intended surface of path; see that the ground is hard and solid; or if not so, fill up with broken bricks or stone, and ram well. Lay on the bottom coating of asphalte 2 in. thick, composed of gravel or, better still, angular broken stone, small enough to go through a 1 in. riddle, and coated with gas tar by pouring the tar over the stones when in a heap, and turning them over several times with a spade. This bottom coating must then be well rolled to consolidate it. The top coating, 1 in. thick, is made in the same way, but with stones or gravel that will pass through ½ in. riddle. Finally, sprinkle fine limestone chippings on the surface and roll over and over again until hard. You cannot roll it too much if you go on for a month. See that the stones are quite dry before mixing with the tar. Do not use cinders if you can avoid it, as they take up too much tar, and make a soft job which will crumble away. See that you slope the surface to allow for rainwater getting away."

Knee-hole Desk.—R. A. L. (*Church*) writes to H L. (*Oxford*) (see No. 163, page 110):—"I enclose a sketch of a desk, the sizes of which are as follows:—Length of top, 3 ft. 10 in.; width, 1 ft. 10 in.; height at back, 3 ft.; height in front, 2 ft. 8 in.; plinth,



Knee-hole Desk.

3 in.; drawer bearers, 1 in.; sides or ends, 1 in.; drawers, 12 in. wide; inside of desk, 3½ in. deep at front; width of knee-hole, 16 in. For instructions as to how to put together, see WORK, No. 140, page 555, Vol. III.: 'How to Make a Chest of Drawers.'"

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—T. S. (*Bolton*); 1892 READER; E. C. (*Norwich*); J. T. (*Ashington*); T. P. (*Warsaw*); R. B. (*Glasgow*); J. H. (*Kinnetty*); WORKITE; TRIPLE; J. G. E. (*Armagh*); DERWENT; ELECTRUM; J. F. (*Leyton*); H. T. R. (*Hamilton*); REV. S. C. W. (*Loughborough*); J. A. K. (*Nottingham*); H. H. (*Devonport*); G. W. A. (*Borough, S.E.*); E. H. L. (*Leicester*); JAW AND SHILLING; LEATHER; R. C. J. (*Upperthorpe*); H. B. (*Brighton*); SPONGE; W. H. W. (*Castleton*); L. E. M. (*St. James's, S.W.*); H. T. M. (*Saltash*); W. O (*Burton-on-Trent*); A. W. (*Aberdeen*); J. N. D. (*Durham*); W. H. C. (*Orillia, Ontario*); IDEA; T. H. S. (*Newport, Mon.*); A. J. (*West Bromwich*); S. J. A. (*Slough*); H. H. (*Sussex*); LAPI; H. W. R. (*Stanningley*); J. B. (*Eastbourne*); E. W. (*Hull*); T. D. (*Oldham*); F. B. (*Dublin*); HYGIENE; J. T. (*Huddersfield*); A. F. B. (*Selly Park*); J. S. (*Derby*); BAINSFORD; T. E. (*Riverside*); A. R. (*Scorrier*); J. W. (*Old Kent Road*); TINSMITH; J. B. (*St. Helens*); W. K. (*Waterloo*); P. J. (*Perranwell, R.S.O.*); JUPITER; ELECTRIC; J. H. (*Battersea*); A. B. C. (*Kendal*); A COUNTRY CABINET-MAKER; DRILL; G. S. (*Preston*).

"WORK" PRIZE SCHEME.

FOURTH COMPETITION.

"Tourists' Road, Water, or Rail, Travelling Requisite" Competition.

To give zest to, and widen the field of original research, such an outfit might, for instance, combine with it some useful appliance to be used in case of emergency—such as life-saving, or in pleasure hunting while holiday bent. This we must leave to our readers' judgment, and feel sure that anything to make travel more enjoyable will be welcomed by the public and the readers of WORK who have to travel. By the time this announcement is made most of us will have had some experience of holidays and the pleasures (?) of luggage. For the three best suggestions for an "Improved Tourists' Travelling Requisite," the following prizes will be awarded—

First Prize, £3;
Second Prize, £2;
Third Prize, £1.

CONDITIONS AND RULES OF THE "TOURISTS' TRAVELLING REQUISITE" COMPETITION will be found in No. 181 and subsequent issues.

All manuscripts intended for the "Tourists' Travelling Requisite" Competition must be addressed to the Editor of WORK, c/o Cassell and Company, Ltd., Ludgate Hill, London, E.C. They must reach him on or before SATURDAY, OCTOBER 29, endorsed, "Tourists' Travelling Requisite" Competition.

"WORK" WEEKLY CONTENTS.

SEVERAL subscribers have kindly made the suggestion to exhibit a weekly contents bill of WORK in their workshops and elsewhere, for the benefit of fellow-workmen not already subscribers.

Doubtless many others who write expressing their indebtedness to WORK may be similarly disposed. If so, and they will furnish their names and addresses to the Editor, such a bill for exhibition will be sent to them by Messrs. Cassell & Co.